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JAMES FULTON PERCY

PRESIDENT, 1918

CAT.

TWENTY-EIGHTH ANNUAL MEETING

TRANSACTIONS

OF THE

WESTERN SURGICAL ASSOCIATION

Twenty-Eighth Annual Meeting

Chicago, Illinois, December 20 and 21, 1918

MINNEAPOLIS
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EX-PRESIDENTS AND MEETING PLACES

PRESIDENT	PLACE	YEAR
S. S. Todd*	Topeka	1891
Milo B. Ward*	Kansas City	1892
Milo B. Ward*	Des Monies	1893
Lewis Schooler	Omaha	1894
John E. Summers, Jr.	Kansas City	1895
Thomas J. Beattie	Topeka	1896
Joseph Eastman*	Denver	1897
David S. Fairchild	Omaha	1898
Homer C. Crowell	Des Moines	1899
O. Beverly Campbell	Minneapolis	1900
August F. Jonas	Chicago	1901
James E. Moore*	St. Joseph	1902
Alex. Hugh Ferguson*	Denver	1903
Charles H. Mayo	Milwaukee	1904
Harvey D. Niles*	Kansas City	1905
Malcolm L. Harris	Salt Lake City	1906
Charles W. Oviatt*	St. Louis	1907
William W. Grant	Minneapolis	1908
Arthur L. Wright*	Omaha	1909
John P. Lord	Chicago	1910
Amos W. Abbott	Kansas City	1911
Lewis L. McArthur	Cincinnati	1912
Jabez N. Jackson	St. Louis	1913
Byron B. Davis	Denver	1914
Joseph Rilus Eastman	Des Moines	1915
Lawrence W. Littig*	St. Paul	1916
Leonard Freeman	Omaha	1917
James F. Percy	Chicago	1918

*Deceased.

The Western Surgical Association does not hold itself responsible for, or necessarily endorse, any of the papers printed herein.

ARTHUR T. MANN, Secretary-Treasurer.

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Executive Session

Transactions of the Twenty-eighth Annual Meeting

Held in Chicago, Illinois, December 20 and 21, 1918.

December 20, 1918—First Day—Morning Session

The Association met at the Sherman Hotel, and was called to order at 9:30 A. M. by the President, Major James F. Percy, Galesburg, Illinois.

Dr. Richard W. Corwin, Pueblo, Colorado, read a paper entitled "Our Duty to the Industrial Army," which was discussed by Drs. Percy, Fairchild, Lord, and Kreider, after which the discussion was closed by the essayist.

Dr. Frank G. Nifong, Columbia, Missouri, followed with a paper entitled "An Ambulatory Chair." This paper was discussed by Drs. Wallace, Davis, Corwin, and, in closing, by the essayist.

Dr. Clifford U. Collins, Peoria, Illinois, read a paper entitled "Parotitis as a Postoperative Complication," which was discussed by Drs. Davis, Schwyzer, Ransohoff, Jackson, Mann, Harris, and, in closing, by the essayist.

Dr. A. E. Hertzler, Kansas City, Missouri, read a paper entitled "Prognosis in Operative Treatment in Basedow's Disease."

Dr. Neil John MacLean, Winnipeg, Manitoba, read a paper entitled "Some Points in the Surgical Treat-

ment of Exophthalmic Goiter and Thyrotoxic Goiter, With Special Reference to the Bilateral Resection of the Gland."

These two papers were discussed together by Drs. Judd, Haines, and Sweetser, after which the discussion was closed by the authors of the papers.

On motion, the Association adjourned until 2 P. M.

First Day—Afternoon Session

The Association reconvened at 2 P. M., and was called to order by the President.

Dr. Henry T. Byford, Chicago, Illinois, read a paper entitled "Purging Before and After Abdominal Section," which was discussed by Drs. Hill (Howard), Wallace, Ochsner, Percy, and, in closing, by the essayist.

Dr. Earl R. Hare, Minneapolis, Minnesota, read a paper on "Fibrosarcoma of the Skull."

Dr. Emil G. Beck, Chicago, Illinois, read a paper entitled "The Empyema Problem; Demonstration of Cases Treated by Different Types of Operation," which was discussed by Drs. Abbott, Ransohoff, Hertzler, Mann, Bartlett, Percy, and, in closing, by the essayist.

Dr. Charles J. Rowan, Iowa City, Iowa, read a paper entitled "Surgical Complications in 1030 Cases of Influenza." This paper was not discussed except by the essayist in closing.

Dr. E. S. Judd, Rochester, Minnesota, read a paper entitled "Carcinoma of the Small Intestine," which was discussed by Dr. Bevan and, in closing, by the essayist.

On motion, the Association adjourned until 8 P. M.

First Day—Evening Session

At this session (the annual dinner) the President, Major James F. Percy, Galesburg, Illinois, delivered his address.

Following President Percy, an address was delivered by Mr. M. Mangasarian, of the Society of Ethical Culture, Chicago, after which the Association adjourned until 9 A. M., December 21.

December 21—Second Day—Morning Session

The Association met at 9:30 A. M., and was called to order by the President.

Dr. H. B. Sweetser, Minneapolis, Minnesota, read a paper entitled "Vaginal Hernia," which was discussed by Drs. Magie, Byford, Schwyzer, Morrison, Abbott, and, in closing, by the essayist.

Dr. W. H. Magie, Duluth, Minnesota, read a paper entitled "Are We Justified in Removing a Comparatively Healthy Gall-Bladder?"

Dr. Byron B. Davis, Omaha, Nebraska, read a paper entitled "Factors Which Determine the Relative Degree of Cure in Biliary Surgery."

These two papers were discussed together by Drs. Collins, Beck, Hill (Roland), Bartlett, Ransohoff, Ochsner, Benjamin, Judd, Haines, Corwin, Harris, and, in closing, by the authors of the papers.

The President read a telegram from Dr. Leonard Freeman, Denver, Colorado, regretting his inability to be present, with best wishes for a successful meeting.

Dr. Arnold Schwyzer, St. Paul, Minnesota, read a paper entitled "Technical Points in Gastro-enterostomy and Plication."

Dr. Harry M. Richter, Chicago, Illinois, read a paper on "Perforated Gastric and Duodenal Ulcer."

These two papers were discussed jointly by Drs. Haines, Davis, Fairchild, Abbott, Percy, Bartlett, and Straus (Alfred) by invitation, after which the discussion was closed by Dr. Schwyzer.

The Secretary-Treasurer, Dr. Arthur T. Mann, Minneapolis, read the report of the Executive Council, as follows:

Report of Executive Council

There were present at the Executive Council Drs. Percy, Jackson, Hill, Abbott and Mann.

The following are recommended as nominees for the Board of Governors of the American College of Surgeons: Leonard Freeman, Denver; William M. Harsha, Chicago, and A. F. Jonas, Omaha.

The following are recommended as officers: President, Dr. Roland Hill, St. Louis; First Vice-President, Dr. Emil G. Beck, Chicago; Second Vice-President, Dr. George N. Kreider, Springfield, Illinois; Secretary-Treasurer, Dr. Arthur T. Mann, Minneapolis, Minnesota.

The following are recommended for the Executive Council for the coming year: Dr. Jabez N. Jackson, Kansas City, to fill out the term of Dr. Lawrence W. Littig, deceased; Dr. Edward Evans, LaCrosse; Dr. E. S. Judd, Rochester.

The following are recommended to be transferred from active to honorary membership: Dr. W. E. Rockford, Minneapolis; Dr. Charles A. L. Reed, Cincinnati.

It is recommended that the transactions be published to the number of about twenty-five more than the mailing-list requires, and that only a reasonable number of volumes (back files) shall be kept.

It is recommended that the dues for the coming year shall be continued as they have been in the past year.

TREASURER'S REPORT

Receipts

Balance in treasury Dec. 15, 1917	$853.81
Fees and dues received during the year	2,545.00
Extra banquet tickets	45.00
	$3,443.81

Disbursements

Petty cash	$19.80	
The Journal-Lancet for printing the 1916 Vols. of Transactions (not paid for during 1917)	982.24	
The Journal-Lancet for printing the 1917 Vols. of Transactions	942.00	
Wm. Whitford for reporting the Omaha meeting	158.88	
Printing	26.60	
Emblems	38.19	
Honorarium to Secretary	100.00	
Banquet, Hotel Sherman	250.00	
Refund to Dr. Samuel Robinson	5.00	
Refund to Dr. E. E. Evans	5.00	
		2,527.71
Balance on hand Dec. 21, 1918		$916.10

The Treasurer's report was approved. Balance on hand December 15, 1917, $853.81; balance on hand December 21, 1918, $916.10.

Kansas City, Missouri, was recommended as the place of meeting for 1919; Chairman of the Committee of Arrangements, Dr. Howard Hill.

Respectfully submitted,

ARTHUR T. MANN, M. D., Secretary-Treasurer.

THE PRESIDENT: What will you do with the report of the Executive Council?

DR. A. F. JONAS: I move that it be adopted as presented.

DR. W. D. HAINES: I second the motion. (Carried.)

Captain O. S. Lowsley, Great Lakes Naval Training Station, Illinois, gave an illustrated talk on the Anatomy of the Prostate and Prostatic Hypertrophy.

On motion the Association adjourned until 2 P. M.

SECOND DAY—AFTERNOON SESSION

The Association reconvened at 2 P. M., and was called to order by the President.

Dr. William M. Harsha, Chicago, Illinois, read a paper entitled "The Correction of Fractures After the Application of Plaster of Paris," which was illustrated by slides. The paper was discussed by Drs. Fuller, Nifong, Lord, Beck, and, in closing, by the essayist.

Dr. W. D. Haines, Cincinnati, Ohio, read a paper entitled "Fractures of the Skull; Surgical Treatment and End-Results," which was discussed by Drs. Percy, Hopkins, Evans (John I.), and, in closing, by the essayist.

Dr. C. W. Hopkins, Chicago, Illinois, followed with a paper entitled "Injuries of the Pelvis Complicated by Fractures and Dislocations." This paper was discussed by Drs. Haines, Sanders, Evans (John I.), Benjamin, Fairchild, Kreider, and, in closing, by the essayist.

Dr. E. M. Sanders, Nashville, Tennessee, read a paper on "Volkmann's Contracture," which was discussed by Drs. Lord, Fairchild, Hopkins, and Nifong.

As the Association had completed its formal program, President Percy said: Before I introduce to you your new president for the next year, I have asked Dr. Haines to express my gratification and also yours for the success of this meeting. It is mainly due to two of our members who have worked very vigorously for its success.

Dr. W. D. Haines: The president has kindly outlined what he wishes me to do for you. I think we have all appreciated the position in which Major Percy and Major Mann have been placed for the past year. War is no respecter of persons, and while some of us have not been at the battle front, we have nevertheless been doing the best we could for the Association, and we were likewise subjected to the same rules of exigency while our president and secretary were away.

Dr. Abbott has filled in the breach of getting up the program and of attending to details to make this a successful meeting, and Dr. Beck, as chairman of the Local Committee of Arrangements, has been very active, and has in no small way contributed to the success of this very enjoyable meeting. Therefore, I move that we extend a rising vote of thanks to all these gentlemen.

Seconded and unanimously carried.

Dr. W. D. Haines: Concerning the address of our guest last evening, Mr. M. Mangasarian, which was highly appreciated by those who heard it, I wish to move that Mr. Mangasarian be induced through Dr. Beck to furnish manuscript of his address for publication in our transactions. I never heard anything so beautifully put, and it is a theme which I believe interests the entire world.

Motion seconded by several members and carried.

THE PRESIDENT: I will ask Dr. Corwin and Dr. Edward Evans to escort Dr. Roland Hill, our new president, to the platform. (Applause.)

Dr. Percy, in introducing his successor, said:

It is with great pleasure that I introduce to you Dr. Roland Hill, your presiding officer for next year, and I want to say that I have been greatly honored by the men I have been sandwiched in between, Dr. Leonard Freeman of last year and Dr. Roland Hill for next year.

Personally, I want to thank you most heartily for the very great courtesy you have shown me and the support you have given me during my administration. My work has been delightful in every way.

I thank you, and I hope we shall meet next year under our new officers and have as good and as profitable a time as we have had this year. (Applause.) Gentlemen, I introduce to you Dr. Roland Hill.

Dr. Hill, in accepting the presidency, said:

Members of the Western Surgical Association: I hope you do not expect me to make a speech. I thank the retiring president for the kind remarks he made in introducing me. I may say, that I have no words at my command to express fittingly my appreciation for electing me as chief executive officer of this Association for the coming year. There is no honor that could be given me that I would appreciate more. To attempt to fill the position that has been occupied by so many distinguished men I feel is a task almost beyond me. However, from now until the next meeting, I shall devote my time and energy to try and make that meeting a success. With your active and hearty cooperation, let us make the Kansas City meeting one of the best, if not the banner meeting of this Association. Again, I thank you. (Applause.)

As there was no further business to come before the meeting, either scientific or otherwise, on motion, which was duly seconded and carried, the Association then adjourned to meet in Kansas City, Missouri, in December, 1919.

ARTHUR T. MANN, M. D.,

Secretary-Treasurer.

President's Address

THE RELATIVE INFLUENCE OF LAW, RELIGION, AND MEDICINE ON THE PROGRESS OF THE HUMAN RACE

JAMES F. PERCY, A.M., M.D., F.A.C.S.

GALESBURG, ILLINOIS

Those of you who believed that it was better for us not to try to hold our meeting this year, must feel gratified at the attendance tonight in spite of the appallingly unusual conditions which seemed to make its postponement reasonable and even imperative. In the absence of a full expression from all the Fellows as to the wisdom of holding this meeting, your officers, elected for the year 1918, to whom you had entrusted the interests of the Association, were unwilling that the records should show that they had, in any measure, been derelict in keeping its affairs in a state of healthy activity. I am sure, also, that those of you who have come to this meeting, and have also contributed to the program, will experience a delightful sense of loyalty and a sincere feeling of proprietary interest in this annual gathering, devoted, as it is, to the development and furtherance of scientific surgery, because of the unusual difficulties in holding a meeting this year.

I would not be altogether just did I not express my personal appreciation and also your sense of indebtedness to our two good friends, Dr. Abbott and Dr. Beck, for what they have done to insure the success and profit of this meeting for us all. And then I want to tell you again, as simply and as earnestly as I can, how much I appreciate the generous spirit in you all which made it possible for me to serve as your presiding officer at this time. As the years have come and gone since you were good enough to include me among your number, I have, I know, grown with you and because of you, and I have also felt the inspiration that these conferences have brought to each of us. Now to stand here as your chief officer for this fateful year brings a kind of satisfaction that can not be adequately expressed by words. But I want to say more than this: I shall continue to look upon this Association as the place where I can bring the fruits of whatever shall come to me in the way of improvement in myself as a man, and also of whatever success I may yet attain in our beneficent art and science of surgery.

I have no recommendations to make as to the lines that we should follow in order to develop ourselves as we express our lines of effort in the further development of surgery; indeed, it would be most difficult in this year of tremendous change along all the avenues of human thought and effort. No one can predict either in science or in government what is just before us. But, I am sure, we can all feel that something different is impending; that the road toward the goal for man and the nation that he is proud to call his own, is widening; and that every effort that he may make now will have back of it the science of arrangement, which will result in a developing form of unhampered progress. May I beg your indulgence, then, if I do not attempt in this address to try to

indicate what some of these impending changes might be, attractive as that subject at this time could be made. Let me, rather, go over with you some of the things that have grown out of former world conflicts and indicate, as well as I can, the relative influences in the human family that the three so-called learned professions,—Law, Religion and Medicine,—have had on the progress of the human race. My purpose in choosing this subject for your consideration is that we may know, in a new light perhaps, that medicine has been actually guided by traditions that have made possible, not only its own beneficent development, but also, in no small measure, that of every other department of human endeavor that had for its purpose the greatest ultimate good of the children of men. Before taking up the main theme of my discussion, however, permit me to approach it again from a little different angle.

I am especially impressed with the unusual significance of this meeting. The war has ended. I am not qualified either to discuss the tremendous human currents that caused it to flame up or to predict what its final effect will be on the governments which the peoples of the world will now create in order to minimize its effects or to profit by its hellish discipline. But I believe that for all scientific endeavor there are in view consequences that force us, as we sit here tonight, to become actors in a new drama. The acme of medical and surgical attainment has come in your day and mine. Modern Medicine and Surgery, try to state it otherwise as we may, began with Pasteur and Lister. They made it possible for us to study the wonderful processes of living pathology in a way denied our confreres before our time. But Medicine and Surgery have never before known the same magnitude of opportunity to delve into and study disorganized brain and nerve, bone and muscle, tendon

or synovial membrane, the joints or the pleura and lung, heart, peritoneum and blood, to say nothing of the neurofunctional diseases, as this cruel war has provided. Thousands of men trained in the best that has resulted in medical education from the marvelously constructive brains of the Frenchman, Louis Pasteur, and the Englishman, Joseph Lister, have already received clues that will make, in the days that are already upon us, a new Medicine and a new Surgery. The medical men in the armies in Europe today, as in no armies that have heretofore existed in the history of the world, are well prepared. Will it require any strain on the imagination when I say that the program of this meeting and of all meetings of medical men in the immediate future, either special or general, will have a new note and will offer not only new problems but a new point of view to the old ones?

The geography of Europe has changed in a way that will probably make for the peace and prosperity of the whole world. Men's minds, liberated from the thraldom of a vicious caste system, will respond to the opportunity now given them to delve into the truths of a scientific arrangement of things in government and in the arts of peace. Even Law and Religion, and as well Medicine, will gain a new inspiration and a new freedom and life, for the individual will broaden from the lowest and humblest to the highest and most deserving. The Anglo-Saxon, with his character and his language, and love of truth and freedom, will spread these attributes over the earth. The face of the medical world will have a new aspect, not fundamentally, but actually. Sanitation and preventive medicine, the new physiology which has grown out of the new science of aviation, the search for bacterial destructive antiseptics which will not injure vital structures, the triumphs to be gained by physio-

logical chemistry, the unraveling of the subtle phases of the functional neuroses, the practical results that must come from the study of the injuries and wounds due to shot and shell and gas,—the emissaries of frenzied men,—the study of syphilis—these subjects (and I have not mentioned them all), as they have presented themselves in their newer aspects to thousands of scientific men in our profession, have also been called to the attention of millions of virile, thoughtful civilian soldiers, not only in our own army, but also in the armies of our valiant Allies, giving them a new vision and a more intelligent sympathy with the hopes and the aims of the medical profession of the world. May I ask further, Is it unreasonable to expect that our own country, with its Crœsian wealth, its intelligence based as it is on a system of universal popular education as its great foundation—will lead in this scientific medical renaissance? Happily, we are not in the position in which the famous Ambroise Paré found himself in 1564 when he had finished his great treatise on surgery. He there records his confident belief that surgery had reached in his day the summit of its possibilities.

I am not a prophet, nor the son of a prophet, and therefore it is not my purpose to try to indicate in this paper just what lines of advance in medical thought and practice will probably grow out of the years of the next decade. That this great conflict of world forces will change them there can be no question. My purpose, rather, is to direct your attention to the relative relationship in the past of the three great departments of human endeavor—Law, Religion, and Medicine—as they have affected mankind in its development from barbarism until the present. Garrison, in his History of Medicine, quoting A. L. Lowell, says: "It is hardly an exaggeration to summarize the history of four hundred years by saying

that the leading idea of a conquering nation in relation to the conquered was, in 1600, to change their religion; in 1700, to change their trade; in 1800, to change their laws; and in 1900 to change their drainage. May we not, then, say that on the prow of the conquering ship in these four centuries first stood the priest, then the merchant, then the lawyer, and finally the physician?"

It is my purpose, therefore, to discuss with you the relationship of the three great professions,—Law, Religion, and Medicine,—as they have influenced the human race in its march toward the realization of its highest ideals. At the very outset I am confronted with the fact that comparisons are invidious, and when, as I fear I may, I shall attempt the task of giving Medicine the modicum of praise, my temerity will need the limit of your charitable indulgence. Permit me to say, further, that any great department of human endeavor can be judged only from the basis of what its leaders have accomplished. From the leaders, the rank and file get their impulse for good or evil, and these again sway the mass in such a way that their acts become the essence of human conduct.

One of the first things that the thinking mind realizes is that nothing is settled except the truth. To the ordinary individual, the truth is that which gives him unquestioned mental and physical comfort. But the unselfish leader of men recognizes that the truth is a very small name for a great law of life which is constantly dragging men not only upward and forward, but also into a position where they can realize, without any subtle element of mystery, that just in the degree they violate the universal law, just in that degree will they be bruised by it.

The law of truth has never been perfectly recognized either by the individual or by the government

he forms. The law of truth is only imperfectly recognized by the systems of religion of the world. This accounts for the dark places in the history of Religion. Theoretically, the best religious system that has ever been conceived by the mind of man should need no conquest to cause its beneficent spread among the peoples of the world. But no system of religion has ever reached this enviable status. As much can be said of the Law. We have law, but not justice, just as we have religion, but not the state of mind that clothes the nation or the individual with the touch of practical brotherhood. We hear it said that, until you change the nature of man, these things will never come to pass, as if man were not changing. To say that he is not, and has not changed his nature, is merely the unquestioned sophistry with which the thinking man deludes not only himself but the unthinking as well. Man has changed; indeed, he is about the only thing in nature that can change. He once bought and sold human life in the open market; but the law of truth condemned him, and he was sensitive to its mandates which he had violated. Today human slavery is outlawed wherever civilization is known.

The purpose of my paper is to show, as far as I can, what the three so-called learned professions have done, through their leaders, toward helping man in his onward progress toward obtaining the best possible form of health, happiness, and justice. Before taking up the argument which may be applied to each of the above mentioned departments of human endeavor, certain fundamental facts must be recognized. The highest type of modern or ancient civilization, judged by the best thought of either ancient or modern times, shows that it was reputable only in spots. Law is not, and never has been, an equivalent for justice. Religion is not always a synonym for righteousness. Medicine has always succeeded in

making practical its mission by bettering the physical condition of the race. Broadly speaking, Law has always been for him who had the money necessary to obtain the justice which it could give. Liberally stated, Religion, where it was not compelled to uplift, has debased and made bigots. Medicine, in all time, and among all peoples, has never had but one purpose, the physical and mental comfort of the race.

Prophecy has always told us that in the future, sometime and somewhere, both Law and Religion would regenerate the race; but experience has shown that this is still only a hope. Medicine has never needed a prophet. The memory of man, which we call history when it is written, tells us that Medicine started where law and religion began. In the beginning, it had the same ignorance, the same superstition and the same inadequate comprehension of its real mission that Law and Religion had. Today, Law and Religion still hold to their primitive foundations; while Medicine, in all its history, has made of its past steps that have led it upward among the peaks where sorrow and pain and anguish cannot endure.

Law, Religion, and Medicine had a common origin in that they grew out of certain necessities of man in his contact with man. Law defined his rights in his relation to other human beings; Religion stimulated his moral nature; while Medicine taught him how to preserve his life. After untold centuries of experience, man finds that Law has been a hard task-master, and through riot and revolution he has been compelled many times to soften its demands. Though he desired its making, he has never been quite able to control the products. As much can be said of Religion. Greater thing than this has not been conceived by the spirit of man. It has always touched him when he looked within, and saw his own conscience, just as it was, naked and bare. Be it said

to his credit that, when he thus communed with himself, he was never satisfied with what he saw. Out of this somber lack, out of this longing for something better than the daily toil, grew the spirit that he named Religion. But this, too, at times, he has been unable to control, and, as a result, he has seen his fellows burned at the stake, to say nothing of ostracism and banishment, when they differed with the majority as to how they should worship the Great Unknown.

I said in the beginning that comparisons are always invidious, and this becomes more apparent when we consider that the three departments of human effort under discussion all spring from the same source, namely, the human family. To discuss them in the way of comparison is therefore much like carrying coals to Newcastle. Life is epitomized in the word "struggle." Man has continuously contended with his environment, even when he himself was responsible for his surroundings. Man, today, is contending with his religions and his laws. Why? Because they are not what he wants. He has too much of one, and not enough of the other. He did this for generations with Medicine. He finally learned that, when it was a part of Religion, it was out of place, and he found this to be true also when he removed it from among the barbers. Man found a place for Medicine at last in the sciences, and, after he placed it there, it has gone with leaps and bounds as the most beneficent, altruistic representative of human success in the world today. Law and Religion will finally be placed among the sciences also; but, until they are, they cannot hope to compete with Medicine as a science in its present comfort-giving assistance in the progress of the race.

Truth is exact. Science is exact. Science is truth demonstrated. Truth as a great law was rung in with

the birth of the morning stars. Medicine was first of the professions to appreciate the value of truth, and its near relative, Science. The value of Science with its inseparable relationship to truth is the supreme appreciation of the civilized world at this hour. Established religion and our present application of law are in a final struggle for existence. Law, with its ages of opportunity, has never made good the undying golden rule. Until it does, it must still contend with man while he evolves rules of conduct which make for justice and truth.

Religion, like quackery, has been individualistic and self-seeking. It has lived and flourished on superstition, and bigotry has been its chief by-product. Instead of carrying the burdens of the human race, it has, through its generals, made war, and striven for the power which only the sword and devastation can bring. When it was kept down by tyranny and oppression, when it was deprived of its place as a political power, it showed its greatest strength, and did its most beneficent work. But Religion, untrammeled, has never, in all its history, touched a tithe of human doubts and fears, of human anguish and despair, of human misery and suffering.

Law will take months and years of time, and untold sums of money, playing the game of battledore and shuttlecock with a wealthy criminal as the motif. Our courts *fundamentalize,* if I may coin a word, legal procedure; but in instances like these they read law into a parody, and make justice the sport of the rabble. Medicine makes its errors of today make more sure the science of tomorrow. Organized religion has always feared science, when it could not control it. Courts rarely deal seriously with evidence, and the law has so constituted itself with fool technicalities that litigants tremble because of its uncertainties. Eighty-six per cent of the present members of our

National Congress are lawyers, and this ratio to other professions and trades will probably hold true as to membership in our state legislatures. But, in spite of this immense advantage, with all the prestige that it gives, our legal practitioners do not meet with certainty, gravity, and promptness the demands that are made upon them by rich and poor alike. The practitioners of law can, and does, make monkeys of the judges by their use of immaterial instructions which they call for and use as a mere pitfall through which they can get their cases into a higher court. The only object of this is that an adverse verdict of the lower court may be upset in the higher, because of some trivial error of the trial judge, an error that really he was purposely forced to make. Without dignity, trailing preciously near the borderline of common dishonesty, legal gladiators thus play fast and loose, not only with human life and crime, but with the property and rights of all classes of citizens. And when these leaders of the legal profession call to their aid the mercenary "experts" of the medical profession, aided by the sensational press of our country, confusion and disorder are substituted for confidence and trust.

Medicine is the only one of the three professions that purposely has not tried to stand still. Medicine had a philosophy and a hope from the days when Hippocrates took his students by the hand, and led them to the altar of science he had erected, that they might swear before it: "With purity and with holiness I will pass my life and practice my art." Your profession and mine has been guided by a code of ethics. It began with the cerulean sky in the early morning of the history of the human race. Out of that misty past, with its wonderful beginnings for our science, and for all science, like a deep-toned cathedral bell, come the words uttered before that

same altar, which have inspired the humble and the great of our guild: "Into whatever houses I enter, I will go into them for the benefit of the sick, and I will abstain from every voluntary act of mischief and corruption." From that island in the Ægean sea was started a moral impulse that has influenced for good the vast majority of our profession, whether they ever heard of the oath of Hippocrates or not.

The legal profession has never had a written code of ethics until within the last two years. Ethics for the medical profession has been no shadowy thing in all its history. The medical profession has been free to seek and to save the physically lost. The leaders of our profession have set the pace. They have visualized the obscure in disease and made it the common property of the humblest member in our ranks. Yea, more than this, they have so stimulated us all that many who would otherwise never have been heard of have been awakened, not only to the beauties of science, but also intellectually; and they, in turn, have enriched our profession because they have, times without number, given health where before was but despair and suffering and death. The story is told of Michael Angelo that he was found standing before the finished work of one of the masters of his day, lost in wonder, admiration, and joy at what he saw of the great artist's work, and was heard to exclaim: "I, too, am an artist."

The leaders of the Law have taught respect for the Law by penalties. Law has organized no clinics that had for their main purpose the teaching of the ordinary layman how to avoid breaking the law. Medicine has been in an age-long fight to compel lawyers to recognize our efforts to banish disease. Both Religion and Law are responsible for quackery in its ordinary and in its worst forms. Law has taught the layman to fear its injunctions; but it has

not taught him the necessity for using care in the selection of the judges who are to issue them. Technicalities, as I see them, are the only defense of the practicing attorney against the ignorant judge whose election in this country the bar has done nothing to prevent.

Medicine has made sewers possible, and drainage canals, and these have led away from the centers of population the death-dealing filth, and lost it in the ocean where it could do no further harm. Medicine has done its work of educating the public so well that the average citizen today knows more of medical science than did the ordinary physician of fifty years ago. If the crimes that have been committed in the name of Religion, by its leaders, had their counterpart in the acts of physicians, we would find the latter dropping the germs of typhoid fever into the wells of a community when business got a little dull. Instead of this, every physician is a teacher of the public in such a way that he is becoming less and less a necessity in the ordinary class of illness.

Law starts in ignorance with that travesty on law, the justice of the peace, and it is continued on through the probate and various other courts in varying degrees of honor and dishonor until it arrives at the Supreme Court of the Nation. But before this ocean of uprightness is reached, whence the correct principles of law emanate, what a tortuous channel must be followed. Every decision, every verdict, every human attempt at getting at things correctly, every citizen, whether man, woman, or child, bond or free, whether rich or poor, whether ignorant or learned, whether he comes with a soul yearning for justice or with the cunning of the weasel hoping that he can defeat justice,—every one of these is met by what? Not by a scientific arrangement of the experiences man has had with man in the myriad ways of civiliza-

tion—not even intricacy, but rather confusion; not even disarrangement, but craft and cunning; not even a jumble, but stratagem and ruse; not with boldness and courage and assurance, but with insidiousness, trickery, and subtlety.

Is the above all true? No. Is it in any measure true? Yes. It is true to the degree that the unlearned public believe it to be true; and what the unlearned public believe to be true, is due to the forces set free by Law itself to teach them. They have no means of knowing more than this, and they cannot, under our system of government, know less. What is law below the Supreme Court of the Nation? It is the political errors of a free people. What is the Supreme Court of the United States? It is the embodiment of the learning and character and knowledge of the will of the legal profession, untrammeled by the will of the unlearned public. The legal profession, through its leaders, has done nothing to make below the Supreme Court what obtains among the members of that confidence-inspiring body. Today every lawyer who has a meritorious case wants to get it before a Federal judge, because he knows that this class of judges are appointed because of their knowledge of the law, and appointed by those who are capable of knowing their qualifications for the position. But the Supreme Court of our country is only an incident in the ordinary affairs of the average citizen. The truth in the law that the citizen gets, then, is what? It is, and always will be, what some enthroned, empowered, embenched, learned, or ignorant judge says it is, instead of truth, pure and simple and undefiled and undefilable.

Both Law and Religion are scientific nonentities. Without science, the intellectual life must remain a dwarf. Man did not really begin to think until he began to invent and make use of mechanical appli-

ances. These stirred his mind along scientific and other avenues of thought, and the lack of these accounts for the very apparent dearth of fresh intellectual effort in both Law and Religion, even until this day.

All three professions are engaged with the welfare of the human biped; the one with his social relations, the second with his physical relations, and the third with the things that stimulate him spiritually; the one with making his life endurable, the other with making his life possible; and the aim of the last is to give him mental comfort and peace. But the legal profession and the theological profession are scientifically behind the medical profession. Either may entertain society and itself with more mental gymnastics, more intellectual pyrotechnics; the molecules of its gray matter may even more easily and readily assume the relation which results in what is called cerebration: but their accumulation of information, their real scientific assets, are distinctly less in quantity and quality than those which confessedly belong to Medicine. Why is this? The answer is but a restatement of the axiom that to retain real intellectual life, to be able to search for knowledge, to dig into the foundations of the earth for it, to ask the stars for it, to grind the rocks to their atoms for it, to tear life to pieces to its very ameban protoplasm for it, to follow Truth to her hiding-places, to find her and hold her,—all this now, as of old, needs a mind untrammeled, a brain unshackled, needs intellectual freedom. The medical profession has it; Law and Religion have it not. Right here both Law and Religion stumble and fall, not from any mental or moral obliquity, but because they can go no farther. The lawyer stands tied to a judge, the judge to a precedent; the minister to a creed or a theory that mayhap was evolved from the mind of a monk starv-

ing because of religious fanaticism in a musty and reeking cell. There stands the eternal confrontment of both of these professions. It is their impassable barrier—*Truth is what somebody says it is.* There is no appeal, no re-examination, no further inquiry, no scalpel, no microscope, no post-mortem.*

When the medical profession was given its freedom, when it was divorced from Religion, and separated from the barbers, and told to travel by the road of science as far as it could go, it was the beginning of a new era, and a new inscription was carved over the temple of life—"He who enters here gains hope." In matters medical I am my own authority, and so are you your own authority. I am held back—no, not this—I am held to a line that has no end as long as I do not violate scientific truth. My jury are men who are my peers. They may not have gone as far along the road of some particular branch of medical science as I have; but by education, by thought, by experience, they know when I talk any part of medicine, whether I am qualified, whether I am honest, whether I am truthful, and whether I am correct. I know them and they know me.

The great man at the bar today is the man who can show his clients, especially the great corporations, how far they can go in evading the law and yet not become subject to its penalties. On the other hand, one of the enlarging things of Medicine has been its willingness to abandon both the theory, and the practice based on it, which a better scientific reason told us was wrong. Medicine does this with a unanimity and a quickness that accounts for much of its progress. If I am proven wrong, I quit my error, and so do you.

* See Address of Hon. Edward H. Hyzer, Milwaukee, Wisconsin: "The Surgeon and the Lawyer." Transactions of the Fourteenth Annual Meeting of the Western Surgical and Gynecological Association, December 28 and 29, 1904.

Medicine began with an ideal, which was the physical preservation of the race. The thought was so great, the purpose of it so mighty, the reason of it so pure, that the most natural additional step was the alliance which it formed with correct ethics. Medicine has never had to change its ethics. Like the soil from which we drink and live, it has stimulated and developed us, so that we have never gotten away from the main purpose of our profession. Ignorance has fought us, but never, except temporarily, won. Law has always kept us from the front line of progress, while organized Religion has had to be beaten back from the line of fear that knowledge would undermine faith in the man-made and unscientific vaporings of the theologian. Religion has but recently recognized that the dead body of a human being was no longer the image of God. Religion has never, except feebly, recognized that it was the incomparable Christ who said: "Ye are of more value than many sparrows." Organized religion has, in all the years of civilization, driven away hosts of the best minds because of its attitude toward science. Every real scientific fact teaches us of the appalling grandeur of God. Religion made the mistake of getting its conceptions of God from the attributes of man. Man is not a God. Man is only an image, a counterfeit, a pretense, when compared to the Being who made the flying machine to be supported by the air, who made it possible for man to whisper around the world through that same air at the time when he limited space with a limitless canopy of blue, and studied it with the apotheosis of science, the stars. No religion has ever made science a part of its creed. No religion has ever, as a part of its worship, knelt before its altars, and thanked God for the life-saving efforts of science, for the comfort-giving of science, for the knowledge of the Universal Creator given us by sci-

ence. Opinionated Religion burns a Servetus at the stake. A religion without science shoots a Ferrer, who dies with "Long live the Modern School" on his lips.

Law shades its opinions in ways that would put to shame the oracle at Delphi. In this way, quackery in all its forms finds aid enough to live outside the bounds of its real limitations. Lawyers have it within their power to give us an officer within the National Cabinet, for the conservation of the health of all the people. National health matters, in this great country of ours, are merely an appendage of the Treasury Department at Washington, while hog cholera has an officer to look after it in the President's cabinet. Law gives no comfort except for money. Law has no legal clinics, no hospitals, no temples over which it has inscribed, "Come without money and without price and find justice;" no cities of refuge where the ignorant, the down-trodden, the foreigner, the unprotected woman, the homeless child will be given the benefits of its protection, without money. Law has never attempted to equalize the great injustices of life. Law has never read the word "altruism" into its statutes. Law, in one supreme moment of glorious vision, said that all men are born free and equal, and then immediately proceeded to sell them from the market-place to the highest bidder. Both Law and Religion have vivisected human beings in order to destroy their opinions. Medicine vivisects in order to make them live. Both Law and Religion have been ignorant of science, and with their ignorance they are content. Neither Law nor Religion has given us a list comparable with the men of science, which, beginning with Roger Bacon, does not end when we reach Darwin, Harvey, Sydenham, John Hunter, Jenner, Claude, Bernard, Pasteur, Virchow, Koch, Lister, Beaumont, Sims, McDowell, Pepper,

Flint, Rush, Fenger, Senn, and Murphy, together with many, many more. Their names stir the mind and heart, and make us instinctively turn with gratitude toward the Being who created them and gave their services to civilization as a great gift.

Science has not yet said its last word. Science is to be the last word in man's efforts toward justice and a perfect morality. As a stage in this progress, Religion is to become ideal, and so also is Law. But, finally, science is to rule every life. Its laws will make more plain the great law of truth, and when that day comes, there will be, as we know them today, no Medicine, no Religion, and no Law. By reasoning, man can never find God, but science will finally uncover the glory of his purpose for man. Neither Religion nor Law can do it. Science deals with and uncovers the facts that God made. Religion revels in mere speculation, while Law is concerned only with man-made enactments. God made it possible for man to enjoy these things, but he also made it impossible for him to attain his highest purpose through them alone. Science is the only pursuit of man that is not in any degree immoral. Science is truth with all of its noblest attributes unhampered. Science is making man ashamed of his inexactness, and finally it will cause him to worship because of pure admiration for the Power that made the universe possible.

This, in brief, is my vision of a day in another age. It may not be exact, it may even be visionary, it may be unjust, but finally, I am sure, you will all agree, even inspiration must be tested by observation and by experiment. Until that time, it is better for us, perhaps, to say with the poet:

Life is too short to waste
In critic peep or cynic bark,
Quarrel or reprimand:
'Twill soon be dark;
Up! mind thine own aim, and
God speed the mark!

OUR DUTY TO THE INDUSTRIAL ARMY

R. W. Corwin, M.D., F.A.C.S.

PUEBLO, COLORADO

Today we have two armies in the United States: The military army, composed almost exclusively of men between the ages of 21 and 45, and numbering not more than three or four millions, and the industrial army, composed of men, women, and children, between the ages of 16 and 70, numbering not less than forty or fifty millions. The war has taught us our duty to the military army, and no less is our duty to the industrial army. Our duty as surgeons to the industrial army is well defined, and may be considered under two heads: first, treatment after injury, which need not be considered at this time; second, treatment before injury, surgical prophylaxis, to which your attention is called this morning.

In the military army, much stress has been placed upon keeping men fit and their power of resistance high. Very largely prophylactic treatment has been left to the welfare and medical departments. Those in charge of these departments have performed their duties with credit, but there is a part more suitable for the surgeons to perform. The war has emphasized that already known, that is, that physical resistance is of vital importance, especially in patients suffering from shock and wounds, and that a person in best physical condition is in best condition to endure operations. When in Belgium and France, I saw soldiers, seriously wounded, brought to the hospital

and undergo extensive operations, and cases of profound shock, rapidly recover and return to the front for active duty. We are told that of the wounded reaching casualty stations, 95 per cent recover and 70 to 80 per cent return to the firing-line within forty days. While it is true that early and proper treatment, before infection takes place, has much to do with prompt healing; yet it is admitted that the soldier's general physical condition has much to do with his recovery. The war has further demonstrated that regular physical exercise, a proper amount of sleep, rest, and recreation, and good food, and minimum dissipation, are far superior to the "go as you please" habits of the industrial army.

It has been proven that not only the young can be made fit, but at least a percentage of the older, and it is to be remembered that many French and English soldiers who have performed active service are not young. This is important when realizing the make-up of the industrial army.

It has been suggested that psychology possibly plays a part regarding recovery—through loyalty in times of war and compensation in times of peace. It also has been suggested that war and peace statistics will show little variation. No matter what statistics may show, the question still remains,—Are we doing all that is possible for the Industrial Army? Those connected with industrial plants are especially interested in these problems.

In the Industrial Army are to be found the following classes:

Those in every walk of life;

Those young and old;

Those physically "unfit";

Those who have little knowledge of the rules of health;

Those who are indifferent to the rules of health;

Those who dissipate;

Those who have dissipated, and are now suffering with venereal diseases or constitutional diseases resulting from dissipation; and

Those who have inherited deformities and weaknesses;

Those inheriting disease. (Gilchrist, of England, states that of a hundred cases of breakdown in the air forces, 27 per cent were due to a nervous family history, and 40 per cent were due to a personal history of nervous troubles in childhood.)

Those feeble-minded or mentally defective who cannot comprehend reasons or remember, and are not improved by training, and who are known as morons and dullards, not caring to be trained, often causing accidents, receiving injuries and injuring others, rejected by the military army and enlisting in the industrial army, and forming a large percentage of industrial workers.

Those improperly nourished and trained.

Those having received injuries and not fully recovered. (The list of defectives may be indefinitely extended.)

One may inquire, What has the surgeon to do with these unfortunates? The answer is that, when these unfortunates are injured, the surgeon has as much to consider as the internist has when they are sick. Mental and physical fitness concerns both.

What are some of the prophylactic duties of the surgeon? In a broad sense,

To educate the employee.

To obtain the indorsement of the employer.

To urge National and State co-operation.

To make known the laws of eugenics, and insist that the breeding of man is as important as the breeding of cattle.

Specifically, he should—

Teach first aid.

Teach surgical hygiene and sanitation.

Teach the nature of wounds.

Teach the process of wound-healing.

Teach the process of wound-poisoning.

Teach the importance of early attention.

Teach the relation of health to wounds.

Teach the relation of venereal diseases to wounds.

Teach the importance of not bandaging tightly.

Teach the importance of the care of the feet, for not only is this a relief to the employee, but it pays the employer. The employee suffering with his feet loses time, his attention is not on his work, and he is more apt to meet with accident.

Teach the importance of properly fitted shoes.

Teach the importance of position in lifting, so as to prevent sacroiliac injuries.

Teach the causes of myalgia.

Teach—why there is no limit to *teaching!*

Limited instruction has been given to those in some large institutions, some departments of railroads, to miners, Y. M. C. A. boys, high-school pupils and college students, but how about the smaller institutions and industries,—those in stores and shops, the common laborers, the section men, the farmers, the lumbermen, and millions of others who are neglected and suffer?

Again, the instruction given is often presented by incompetent teachers, and rarely includes surgical essentials. Physical instruction in our public schools is being severely criticised, the critics claiming that it is not making pupils fit, but often unfit. One asks,—

How much of the foot troubles of pupils in high schools is due to the prevailing methods of gymnastic instruction, and how much to the prevailing styles of shoes?

What could be done in a gymnastic way to prevent weak and fallen arches?

Are there from 50 to 80 per cent of defective spines in high-school girls, as some investigators report?

We are told—

That from 30 to 40 per cent of the men examined for the army were rejected as physically unfit. In one state 53⅓ per cent were rejected; and in another state 85.87 per cent were found physically unfit.

That a large percentage was suffering from hernia, foot deformities and other surgical defects.

That these millions of defectives, between the ages of 21 and 30, have been turned back into the ranks of the Industrial Army.

That 60 per cent of the men rejected owe their impairment either to ignorance or neglect. Does not the same condition exist in the Industrial Army? What the proposed Lane physical education and training twenty million dollar bill may develop, remains to be seen. The Smith-Hughes Federal Education Bill provides millions for vocational education of the Industrial Army, but ignores the problems of health and rehabilitation; at least it seems to fail in making provision for prophylactic education.

That the Industrial Army demands surgical protection, as well as surgical treatment.

Are we not to protect, as well as save?

Is not the surgeon best qualified to satisfy this demand?

Has not the surgeon been too modest and permitted others to occupy his territory? Is it not time for the surgeon to assert his rights? Is not his duty to the Industrial Army plain? Now that peace is here let us become earnest instructors in prophylaxis.

DISCUSSION

Dr. James F. Percy (Base Hospital, Camp Kearny, Calif.): To me this is an intensely interesting paper because it opens up what is before us after we get down to the regular routine of our life after the soldier gets home. I never understood until the last few months why the soldier had so little respect for the civilian; but, if you put a civilian in the army and train him, he has not much respect for his civilian brother, because of this lack of training. This is the foundation of this paper. In order to obtain the things that are outlined in the paper by Dr. Corwin many problems will have to be worked out.

Dr. D. S. Fairchild, Sr. (Clinton, Iowa): The difficulty which confronts us at once is, facts upon which to base conclusions about what should be done. I have examined some 1,600 men for army service, and some 5,000 for railway service, and the conclusions are, that we want first to inquire into the ways of living of working men. If every industry could establish a plan of examining the men received into service, and then ascertain how those men live, we should have something to go on in judging how to improve conditions. It was found in our state that 20 per cent of the men rejected because of physical disability were under thirty, and over that age more than 30 per cent were rejected, or about the same as the men for railway service. It was thought that on account of war conditions it might be necessary for our railway people to employ men who would not be accepted as soldiers, and I took the opportunity of visiting the homes where many of these men lived, the older men who would not be taken under ordinary conditions for war, and I found many of the homes insanitary, dirty, and where vice prevailed to a large extent. The conclusion I reached was that, if we could in the first place start out with a plan of physical examination, and then follow this up by finding out how these people lived, we would know what we must do in order to improve conditions. We can lecture and teach those men as much as we please, but they will forget it the next day.

Whether we shall ever come to the health insurance I do not know, but that is immaterial here. We should simply know the kind of physical defects we have to deal with and how people live, and from these two points of view we may be able to devise a plan by which better conditions may be brought about.

Dr. J. P. Lord (Omaha, Nebr.): This is a thought I wish to bring forward. We all realize the great amount of physical disability that prevented men from being accepted in the military service, and these men were very anxious to have that physical disability removed in order that they might enter the service. These physical requirements are made in various branches of the military service, and this has intensified the interest of people in their own physical conditions, and they have tried to remedy them. Nurses ambitious to enter the nursing service would seek to have foot defects relieved so that they could get into service. Large corporations exact these things, but it is not general. Just as soon as these requirements are generally exacted the individuals are going to see to it that they are made fit for their jobs. A few years ago a movement was started in Boston requiring nurses to have foot-inspection before being accepted. This is now being done in many hospitals, but many do not require it, and consequently many who are physically unfit as regards their feet get in. This applies to everything, but just as soon as it becomes known that certain physical requirements must be met before employment can be obtained, people will strive to meet them, and that seems to me to be the greatest influence we can exert in order to bring to pass these conditions. I think that this is so fundamental that it will drive people to give attention to their various physical defects. The Army recognized it, and now, if industries adopt it, there will soon be great improvement in the minor physical defects.

Dr. George N. Kreider (Springfield, Ill.): I shall speak particularly about two points: first, about overweight. I have examined at least eight hundred medical men, and have been very much surprised to find how large a proportion of them are handicapped and therefore unable to get into the service on account of over-weight. At least twenty of these men have appeared before me, and I refused them. They were very anxious to get in, and when I told them that it was possible for them to lose that weight and fit themselves for the service in a great number of cases, 70 per cent, at least, they undertook to do it. One man came in who weighed 254 pounds, and was told it would be impossible for him to get into service with that weight. I prescribed diet and exercises. He came back having lost thirty pounds inside of ninety days. He was admitted, and this week he came in discharged from the service weighing 202. He looked like

a different man, and expressed great appreciation of what I had done for him in showing him how to reduce his weight. Here is a big lesson for the surgeon. Many times I have had people come in with great weight complaining of obscure pains, and wanting to be operated on, but before operating I have insisted that they first reduce their weight, and in the second place I have refused to operate for these obscure pains. I could detail at least a hundred cases of women who have come in in my early days, and I have cut to find the trouble, but now I diet them and 90 per cent of them do not need an operation at all. If they get their feet fixed and their flesh reduced, they do not need an operation.

Another point I will mention is in regard to shoes. I hope the Doctor has seen an article in the *New York Medical Journal* about the vanity of men. We have been in the habit of ridiculing women, but men are just as bad. A man in the Illinois legislature introduced a bill to regulate the height of women's heels, and I took his part and did what I could. I think it is a matter of medical importance that this matter of shoes be taken care of. It is almost impossible for women to get suitable shoes. I hope such a bill will finally be passed. There are one or two dealers in my town who are supplying people with good shoes, and they are doing a great deal of business. I take great pleasure in sending people there. Gastroptosis, heart trouble, and many other infirmities are caused by bad shoes; and it is important for a surgeon to have this in mind, and lend his assistance to any effort to get better shoes.

Dr. Corwin (closing): I have little to add, but there is much to be added to what has already been said regarding surgical prophylaxis. I am glad my paper has provoked discussion, because it is as important to teach people how to prevent physical deformities or arrest the development of surgical abnormalities as it is to treat and cure injuries, or to make accidents impossible by the installation of safety devices.

Prophylactic teaching should begin with eugenics. Why wait two generations before making suggestions? Why should not the successful farmer apply his stock and grain raising methods to his family? Is it not as important that the human family be well bred as it is that a hog or fowl should come from good stock? Many deformities could thus be prevented. I know of a family where the father is a drinker, the mother is feeble-minded, and some of the chil-

dren cannot talk, and all are mentally or physically deformed. We should see that the State and Government take a hand in preventing the breeding of such brutes. It cannot be left to the individual.

There are many prophylactic industrial surgical problems for this Association to consider, but time places a limit. No part of the body demands greater attention than the mouth. Who can do himself or his job justice with aching teeth? Who can escape general infection if afflicted with decayed teeth and ulcerated gums?

How nearly a full day's work can one perform when suffering from deformed or diseased feet,—corns, callouses, bunions, broken arches, etc?

How many, unintentionally but deliberately, strain their backs by taking an improper position when lifting a wheelbarrow, rail, or plank like this (demonstrating)?

These are some of the duties that the surgeon is best fitted to perform, that man may be not only more efficient, enabling him to command better positions and higher wages, but—what is more important—that he may escape accidents and avoid suffering.

AN AMBULATORY CHAIR

FRANK G. NIFONG, M.D., F.A.C.S.

COLUMBIA, MISSOURI

It is our duty as physicians and surgeons more fully to recognize our obligations to our convalescent patients recovering from both injuries and illness, and to see that they reach complete mental and physical restoration. This accords with our newer ideas of our duties as a State to those who have served us. We should each realize more fully this obligation to our individual patients, and stay with them during what is often a most difficult and trying experience, and help them to "carry on" to complete recovery.

Every device, suggestive, mechanical, or what not, that may be helpful, should not be overlooked. Mental suggestion and all manner of encouragement are necessary to promote the more rapid restoration of the fever patient during his convalescence; and this should not be left to the unskilled. Those fractures and injuries of the lower extremeties, which have necessarily been treated in bed for a long time, leave the patient ofttimes in a most deplorable state. It requires all the skill and patience of physician and attendants if successful recovery is attained. After such injuries and protracted illnesses it is not only the emaciation and flabby muscles with which we must deal, but likewise a mental state which is equally as flaccid.

It is the proper estimate of the real condition of such a patient which we wish to emphasize and to protest the perfunctory prescription of a pair of

crutches and such unskilled help in getting up and out as may, by chance, be available.

This weakened mental and physical state so analogous to that of a little child beginning to walk has suggested the helpful appliance which I wish to present. It is simply a modification of the well-known baby-walker adapted to the needs of such patients.

Figure 1 fairly represents the device. It should be made of light, strong material, preferably of hickory or ash, and of dimensions which allow passage through ordinary doors. The end opposite the seat should be open, as shown, so entrance from the bed may be easy, as you will note in Fig. 2. The manner of walking and supporting the weight of the body partly by the arms is also shown in Fig. 3. At any moment, when the patient feels faint and tired, he may sit down, as you will note in Figs. 4 and 5. With four points of support in addition to his own legs, the patient is very soon able to walk, and even ascend stairways with perfect safety.

Some very good reasons for the use of this chair and its adoption as a part of the armamentarium of well-regulated hospitals might be given.

In the first place, it inspires confidence in the convalescent and cripple, and quickly promotes self-reliance, which is a very necessary factor in promoting recovery. He soon goes along without attendants, and much more quickly than if he depended on them. He realizes that he is supported by a broad base and has no fear that he may fall. He sits down as soon as he is tired. He enters from his bed with ease, and may be encouraged to take care of himself from the beginning of his efforts, which is so important psychologically.

In the second place, the patient needs much less assistance from attendants, and very soon may do without them. This is not an unimportant considera-

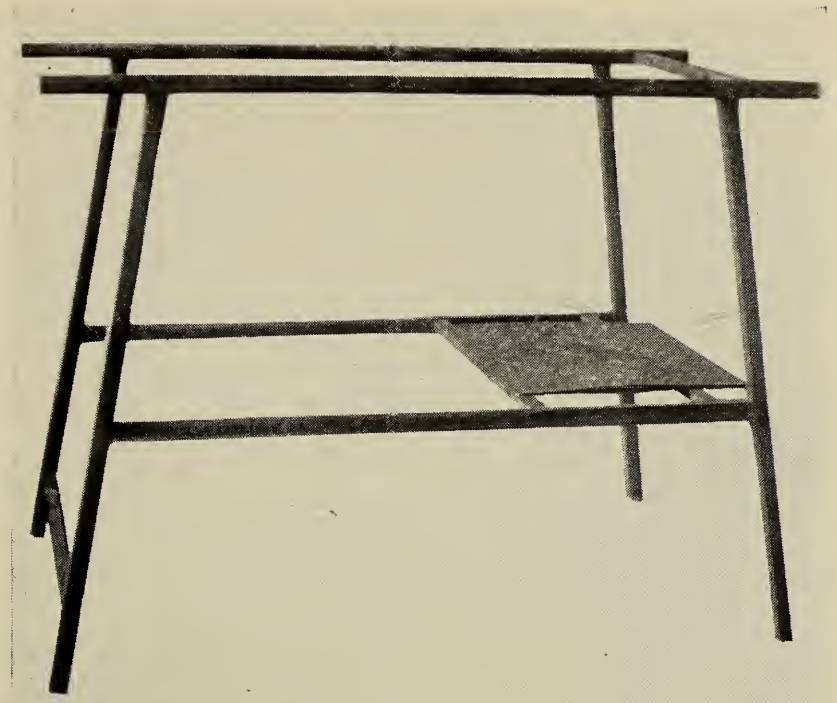

Fig. 1. This illustrates the ambulatory chair. It must be made of light strong wood. It must not be too wide, but must freely pass through the average two-foot eight-inch door. The length at the bottom is 47 inches; width at bottom, 29 inches; length at top, 49 inches; width at top, 24 inches; height of seat, 16 inches.

Fig. 2. Shows the patient entering the chair from the bed.

Fig. 3. The patient walking in the chair.

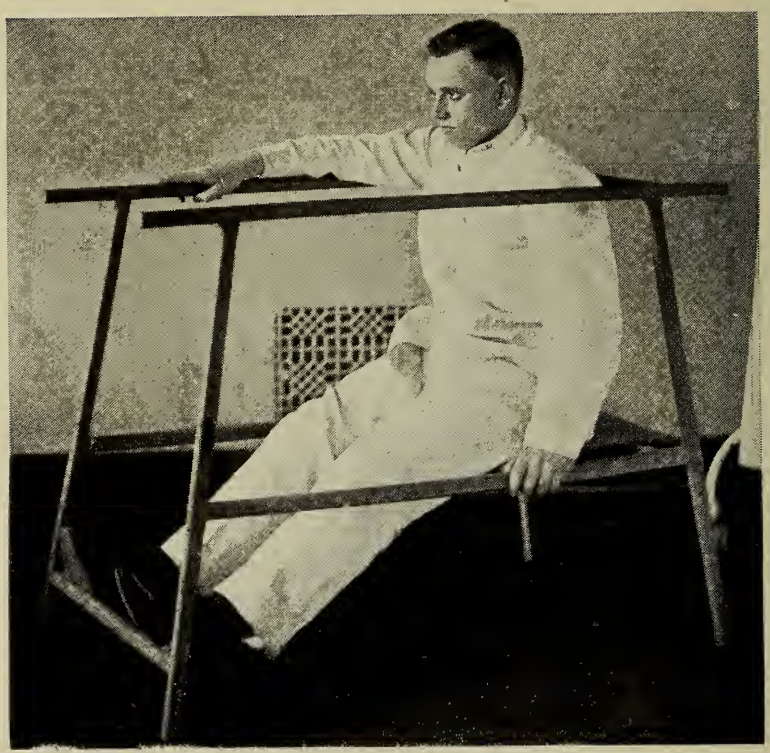

Fig. 4. Shows the patient sitting in chair.

Fig. 5. Shows the patient sitting in the chair resting with the leg in a plaster cast.

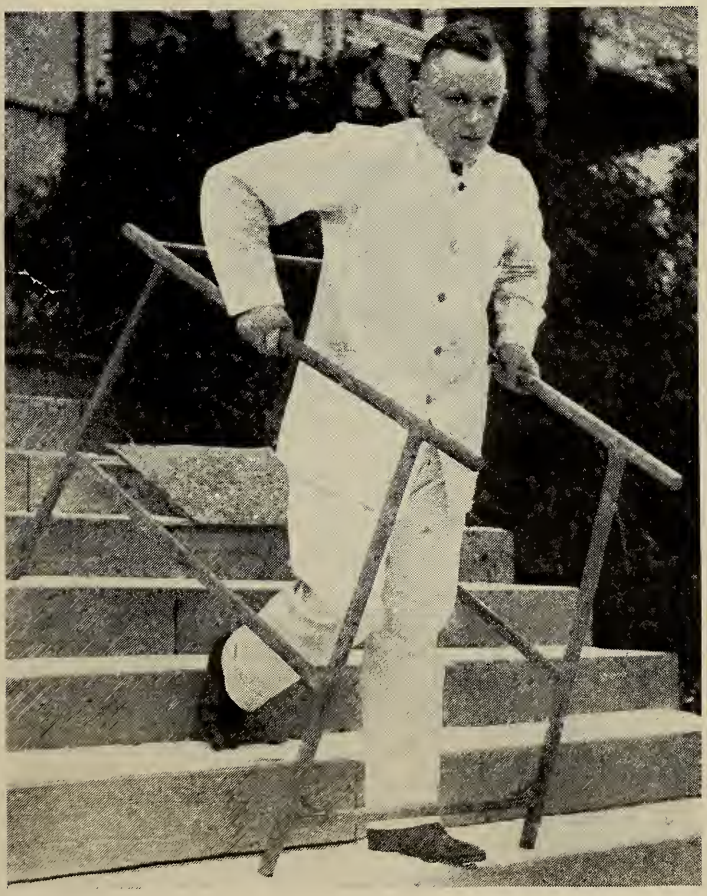

Fig. 6. Shows the safety in descending steps.

tion when convalescence may be a matter of weeks and months.

In the third place, there is no danger from disastrous falls, from pressure-paralysis, and consequent wrist-drop so often seen when weak and emaciated patients have tried to use crutches. It is well known how much delay in recovery is experienced when such an accident supervenes.

In bringing this rather simple device to your attention may we not hope that you will give it your kindly attention, and trust that you will feel that, to do your full duty to such patients, it is not sufficient to prescribe a pair of crutches and leave them to their fate? Let us realize that our obligation extends further and that we have not finished until we have helped the patient to ultimate functional recovery.

DISCUSSION

Dr. C. H. Wallace (St. Joseph, Mo.): I want to recommend this apparatus of Dr. Nifong. We can readily see the utility of this simple device in this class of injuries. I think we have all appreciated the difficulties we sometimes have in getting these patients to venture out on crutches, and this device will find a useful place in the convalescing period from the bed to the crutch.

Dr. Byron B. Davis (Omaha, Nebr.): I am particularly impressed with this little apparatus on account of some experiences I have had in trying to train patients in the use of crutches. If the patient is nervous and a little fearful, or if he happens to be old and heavy, it is almost impossible to get him to muster up enough courage to use crutches. It takes a long time to do this, and I think, with something like this, we could begin its use a good deal earlier than with crutches. In the second place, I have had two or three rather bad accidents with crutches. Patients have started out too quickly and injured themselves badly. It seems to me that this apparatus would fill the function of the crutches when patients begin their ambulatory treatment, and do it much better than the crutches can. I certainly am going to use this kind of an apparatus; try it at any rate, for it looks to me like a sensible invention.

Dr. Richard W. Corwin (Pueblo, Colo.): I hope that Dr. Nifong will give us the dimensions of this apparatus for I want to make some when I go home. I want the size of the material and the size of the apparatus.

Dr. Nifong (closing): I was a little diffident about presenting something so simple to men who ought to have known such things before, but the simplest things are sometimes the ones we overlook. I should not apologize for it, for I have used it for a number of years successfully and have come to appreciate how much it means to the class of patients I have mentioned. It is not intended to replace the crutch, but to be used before crutches for those weakened patients who cannot possibly use crutches and who often have not the money to supply themselves with attendants, and very often attendants are not as efficient as this thing. Those patients do not soon get confidence in themselves, and confidence is very necessary. You have all seen patients who were mentally and physically incapable of walking. They were scared when you put them on their feet; but, if you put them on the side of the bed and let them try this thing as far as putting their hands on the side bars, they will gradually and rather rapidly get in and begin to use it. As you know, crutches in the case of old, thin individuals, or even young, thin ones, are liable to make some damaging pressure if they are used. Crutches are really for pretty agile individuals. Take and try them yourselves and you will not use them very efficiently at first.

This device was suggested to me many years ago. I used to see an old farmer, a cripple, who had no use of his lower extremities. He would come into town, and take something of this sort out of the back of his buggy and hop right along. He had no seat in his contrivance, but sat on the side rail—or the court-house fence.

When I put the article in the Transactions I will put the dimensions down accurately, but I do not have them with me now. I will gladly furnish them if you will write me. The body is not more than twenty-nine inches long, the seat is about sixteen inches high, and the top varies in height. They are preferably made of light, strong material. not too heavy. For hospital use, where they would be roughly used, they would require a little heavier material, but they want to be easy to handle. I have one that is made of hickory that has been used for a long time. They do not fold up.

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PAROTITIS AS A POSTOPERATIVE COMPLICATION

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PEORIA, ILLINOIS

In the year 1915, 4 of our patients developed parotitis, and 3 of them died. This was considered a sufficient reason for making a study of the subject, which was done. The things that were learned from that study seemed to be valuable because we have had only two cases of parotitis since, both postoperative, and neither one died.

First, we went over our records, and found that in 6,100 patients who had been operated on, 7 had developed parotitis, and 1 patient developed parotitis and died while waiting for operation. A study of these cases was made, which follows.

All of these 8 patients had been in the same hospital, which had no special significance, we thought, because practically all of our operative work is done at this hospital. Five were males, and 3 were females. All of these 8 patients had had abdominal operations except one, and he had an abdominal infection, peritonitis following appendicitis. Three were operated on for obstruction of the bowels, 2 were operated on for ulcer of the stomach, 1 had a panhysterectomy done, and 2 had peritonitis. Two of the patients had fecal fistulæ, and 1 had a colostomy when the parotitis developed. In 5 patients both glands were inflamed, and in 3 the right gland only was affected. Five patients died, while 3 recovered. Of the 5 that died

3 had abdominal conditions that might have caused death anyway, but in 2 of the 5 the parotitis was evidently the principal cause of death.

In 6 of the patients there was no positive evidence of suppuration in the glands. Two recovered without suppuration, and 4 died. Of the 4 that died, 3 died in so short a time after the parotitis developed that there was hardly time for suppuration to become manifest. In 2 of the patients suppuration became apparent, and the glands were drained.

It was deemed significant that 7 of these patients had had abdominal operations, and the other 1 had an abdominal infection, peritonitis. The 7 patients operated on had received scopolamine, $\frac{1}{100}$ gr., and morphine, $\frac{1}{6}$ gr., as a preliminary hypodermic before the operation. As is well known, scopolamine dries up the secretions of the mouth and salivary glands. But 1 patient had not been operated on, and had not received scopolamine. So evidently scopolamine was not a factor in the production of parotitis in that patient. All of the patients had been on the Ochsner treatment and nothing had been administered by the mouth for several days. An effort had been made to supply these patients with sufficient water by administering salt solution and bicarbonate of soda solution per rectum.

After a study had been made of the case records of these patients a study was made of the literature. Nearly all of the cases of postoperative parotitis reported in the literature we studied followed abdominal operations. This seemed to be significant.

One of the most interesting articles we found was by H. B. Rolleston and M. W. B. Oliver.[1] They studied 1,000 cases of gastric ulcer treated in St. George's Hospital in twenty years, from 1889 to 1908. These patients were all treated medically and not surgically. In 470 patients treated by oral starvation there were

21 cases of parotitis, or 4.5 per cent, while in 530 patients who were allowed something by mouth there were 2 cases of parotitis, or 0.4 per cent. These two patients were on rectal feeding, but had been allowed to suck a little ice. It should be noticed that these patients were suffering from an abdominal condition, gastric ulcer, that food and drink had been interdicted by the mouth in practically all of them, and none of them had been operated on. It is evident, therefore, that some factor other than something pertaining to a surgical operation was a cause of the trouble in these patients. The authors sum up their conclusions as follows:

"1. Secondary parotitis may complicate cases of gastric ulcer treated medically by oral starvation.

"2. That it occurs ten and a half times more frequently in such cases of gastric ulcer than in cases allowed fluid by the mouth.

"3. That it is an outcome of the dry condition of the mouth, and that mouth washes do not prevent its recurrence.

"4. That it is more often unilateral than bilateral.

"5. That suppuration occurs in about one-fourth of the cases, and that this constitutes a grave complication."

Curiously enough, there is an article in the same journal by W. S. Fenwick, entitled "The Prevention of Parotitis During Rectal Feeding."[2] He believes that the infection ascends Stenson's ducts. He tried various measures to keep the mouth clean during the rectal feeding, but they were not successful. Then he made an effort to promote a continuous flow of saliva by having the patient chew horseradish, pieces of raw meat at intervals, or keep a pebble constantly in the mouth. He finally had the patients suck an India rubber teat about two inches long, which produced the desired effect. He said the patient sucked the teat for

hours at a time, and thus kept the mouth clean and moist. After he adopted this method he treated more than 30 cases of hematemesis by rectal alimentation without being troubled in a single instance by parotitis.

An article by Jacob Frank[3] discusses the different theories and sums up as follows:

"1. That it is highly probable that secondary parotitis is due to an ascending infection of Stenson's duct.

"2. That the onset of this complication may be prevented by attending to the following details: (a) mouth carefully cleansed before and after operation; (b) everything used for the anesthetic should be sterile; (c) the anesthetizer should avoid pressure on the gland while attempting to elevate the jaws during anesthesia.

"3. When the swelling does not show any tendency to decrease in size, in about four days, it is advisable not to wait for fluctuation, as the location of the pus is beneath the dense parotid fascia. Therefore, free incision and drainage should be resorted to early."

From the study of our cases we are inclined to agree with the conclusion of Frank that the cause is usually an ascending infection from the mouth. All of our patients had been on the Ochsner treatment, and fluids had been withheld by the mouth. Two of our patients had a fistula of the small intestine, which allowed the liquid contents of the small intestine to escape before the fluid portion was absorbed. Both of these patients died. We became convinced that the parotid glands in our patients had become inactive because nothing had been taken into the mouth to excite activity of the gland, and that this inactivity predisposed the gland to infection. We also became convinced that our patients had not received enough fluid, and this further contributed to inactivity of the parotid glands and dryness of the mouth. A study of the practical results of trying to give fluids per rectum

convinced us that the patient did not get nearly as much fluid by that method of administration as we had tried to make ourselves believe that he did. When we put good honest nurses in charge of the proctoclysis and received honest reports we found that about half of the patients retained very little, if any, of the fluid. The remaining half of the patients retained perhaps half of the amount of the fluid administered. After two or three days' administration the rectum usually becomes irritable, and retains none of the fluid. I wish the gentlemen in the discussion would tell whether they are satisfied with the rectal administration of salt solution by proctoclysis. I would like to know whether I am alone in my experience with it.

So we considered our first problem was to keep the parotid gland actively secreting and passing a current of secretion down Stenson's duct into the mouth, and our second problem was to keep the patient's body supplied with sufficient fluid.

In solving the first problem we tried the use of chewing gum, but it did not seem to work well. Perhaps the ingredients of the brands of chewing gum defeated our purpose. At any rate we discarded chewing gum after a trial with it. Then we tried letting the patients chew on a rubber nipple following the suggestion made by the English author quoted above. While we were doing this a colleague called attention to the fact that acids excited the parotid gland secretion, as evidenced by the diagnostic measure of having a patient suspected of having mumps try to eat a sour pickle, and suggested the use of acids. We then tried putting a lemon drop in the nipple. Finally we gave the patients old-fashioned lemon stick candy to suck, and that gave the best results. Whenever it is deemed best to withhold food and drink by the mouth for a time, as in stomach operations, peritonitis, or paralytic

ileus, for example, the patient is given a stick of lemon candy to suck, but not to eat. It excites a flow of saliva, and keeps the parotid gland active. Observation has seemed to show that there is not enough secretion swallowed at one time to excite peristalsis of the stomach or bowels. At least the patients did not complain of peristaltic pains while using the candy.

The second problem of supplying the patient with sufficient fluid was solved by following the suggestion of Kanavel,[4] and putting the hypodermoclysis needles in the axillæ, and leaving them in situ as long as necessary in order to save the patient the pain of reinsertion. A pint of normal salt solution may be given every three or four hours in this manner, and you know that the patient's body receives the entire amount of the fluid. We have left the needles in four or five days, and the patients did not complain of discomfort. Incidentally, we believe that this measure has saved lives for us in other conditions as well as postoperative parotitis. Sometimes we keep the solution going continuously through the needles into the tissues for several hours.

If the inflammation has not been prevented by the above means, a free incision with adequate drainage should be instituted early, in about four days, if the inflammation is not subsiding by that time. The capsule or fascia covering the gland is so dense that it takes a long time for the pus to work through and give evidence of its presence on the surface of the skin. It usually works along beneath the fascia and breaks into the external auditory canal.

Vilray P. Blair[5] makes a plea for the early institution of surgical treatment on the third or fourth day, and shows a cut of the incision he uses. He claims that this incision heals spontaneously with a hardly noticeable scar. This incision has been used by the

writer a few times, and the results so far corroborate the claims of Blair.

CONCLUSIONS

1. Postoperative parotitis is more apt to occur after abdominal operations than operations on any other part of the body.
2. Its development is favored by a dry condition of the mouth and a lack of fluids in the body.
3. The infection usually ascends through Stenson's duct.
4. In patients whose abdominal condition makes it necessary to withhold food and drink from the mouth and stomach for a time, prophylactic treatment should be instituted.
5. The mouth should be kept clean and moist by its own secretions, and the body should be abundantly supplied with water.
6. A good way to excite the secretions of the mouth and keep a current of saliva flowing *down* Stenson's duct is to allow the patient to *suck* on a stick of lemon candy.
7. A very accurate and effective way to supply the body with fluid is to administer salt solution by hypodermoclysis. If this is done according to Kanavel's directions there will be no pain in the administration and very little discomfort.
8. If the prophylactic treatment fails, and parotitis develops and the inflammation is increasing, or is no better by the third or fourth day, the gland should be uncovered by a free incision, and punctured in several places with blunt forceps, and the incision should be packed with wet sterile gauze as suggested by Blair.

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DISCUSSION

Dr. Byron B. Davis (Omaha, Nebr.): There are one or two points that I wish to say a word on. This is a very instructive paper, and I suppose we have all had some experience with parotitis. I, myself, have been very much worried about getting a nurse who could apply a proctoclysis in a way which did not result in the way that Dr. Collins has mentioned. The rectum becomes irritable, and you have to discontinue the proctoclysis. I have sometimes succeeded in getting a nurse who could do this. The normal salt solution should be injected so slowly that at no time is there a pool of normal salt solution in the rectum. Unless it is absorbed almost as rapidly as it is introduced we shall have trouble. The solution should not be injected more rapidly than the patient will absorb it, and then it is of great value. I do not know of anything that requires a level-headed nurse any more than this.

I was sorry that the Doctor rejected gum. For many years I have been following the plan with patients who could not take fluid very well and had dryness of the mouth, of keeping them supplied with gum, and in my experience it seems to allay the trouble and cause enough saliva secretion to prevent trouble.

As to incisions: Long incisions are, of course, sometimes necessary, but in the few cases of post-operative parotitis that I have had to operate on I have tried to make a rather small skin incision, and introduce the forceps. In the majority of cases you can get ample drainage in that way. Of course if large infections are running down into the neck you have to use a larger incision.

Dr. Arnold Schwyzer (St. Paul, Minn.): We have heard now that the infection in these cases comes through Stenson's duct; and undoubtedly this must mostly be correct. But why do we have parotitis comparatively frequently after operations? There must be another element besides starvation. This other point, a mechanical trauma, I heard mentioned in the paper, but it is worth while to emphasize it more. During operations we often see anesthetists lift the jaw in a forcible way at the angle; and in this way the parotid can be injured. In a duct leading from a cavity so used to germs as the mouth we must have something in addition to bring on this infection after operations. We have a system with its drainage canal that is ready to take care of a certain degree of infection, as it does in other cases of starvation;

therefore we must lay stress on the addition of trauma to the gland. When the jaw is to be opened, it should be remembered that force at or behind the angle of the jaw can do harm.

Dr. Joseph Ransohoff (Cincinnati, Ohio): I was particularly interested in this paper, especially because the subject is not often given to surgical associations. I think there is little doubt that the trouble is due to ascending infection through Stenson's duct. We can all remember when as boys we blew a tin horn pretty hard, and at night were punished for the crime by a pain in both ears. It is almost impossible to set the lips so that it will not cause this pain.

I want to ask these army men if they have seen anything like this pain in the parotid gland among buglers?

I do not think we see as many cases of suppurative parotitis as we used to. When we saw so many cases of typhoid fever and those things, we saw many such cases, but since we pay more attention to mouth hygiene it has been reduced. There is no doubt that it is an ascending infection in some cases, but in some cases there are other things. The removal of a cyst or an appendix in which there is no sign of a recent infection is often followed by an infection of the parotid gland. This should be so because we see the reverse occur in the ordinary parotitis of contagious character which we know as "mumps."

I would like to ask the essayist whether he has had any parotitis develop after an operation for a nonseptic condition where there was no effort to keep the patient from taking fluids.

I think the extensive operations for treating abscesses of the parotid gland are not necessary. Those cases that I have seen have not required the very extensive operations indicated by the illustrations.

There is one thing I would like to say, and that is that in one case which was very much neglected the parotid abscess opened into the pharynx. That must have necessitated a very unusual condition, but there is one process which drops down behind the pharynx and is separated from it only by a thin membrane, and an abscess there might give rise to bleeding that would be difficult to control.

As the essayist has stated, in many cases it is not necessary to operate at all, for the patients are seen at a time when nature has drained the affair through the jaw. There is a nice avenue for the escape of the pus in that way.

Dr. Arthur T. Mann (Minneapolis, Minn.): At one base hospital where I have been we had about eleven thousand cases of influenza, and in connection with those there were some six of the parotid abscess cases. The first case I saw had been diagnosed as Ludwig's angina, but when I saw it it did not seem quite like that. There was a definite swelling which reached half way down the neck, and then there was a red edematous swelling suggesting an abscess in the deep tissues. They went for it, and failed to find it. Four days later, as the condition continued to grow worse, the patient was again operated on, and at that time an abscess inside the parotid gland was found. The abscess was drained, and the man got well.

After this experience the other cases were identified, and each case had an abscess inside the capsule of the parotid gland. An extensive incision was not necessary. An incision which went to the capsule, and a blunt opening by the Hilton method through the capsule was the only operative measure necessary in these cases.

Dr. M. L. Harris (Chicago, Ill.): We were asked by the essayist to discuss the subject of proctoclysis in connection with his paper. For some time I have discontinued the use of normal salt solution in proctoclysis because of the tendency to get too much salt into the patient. Sodium chloride tends to the retention of fluid in the body. I have substituted for the sodium chloride sodium bicarbonate, 1 per cent, which favors the elimination rather than the retention of fluids. Furthermore, the alkaline solution stimulates the secretions, and there is not the tendency to dryness of the mouth that comes from the sodium chloride.

Dr. Davis spoke of giving the proctoclysis too rapidly. That is true. I have it given by the drop method and limit it to twenty drops a minute. If that is not retained it is reduced to ten. In that way you get seventy-two ounces in the twenty-four hours, which is all a patient needs.

The great trouble in giving proctoclysis is, that nurses seem to forget that the colon is frequently filled with gas, which must be expelled. They do not recognize that, and in expelling the gas the patient expels the fluid. The proctoclysis should be discontinued every few hours and an enema given, so that the patient can expel the gas. The colon should be allowed to rest a few minutes, and then the proctoclysis should be continued. In that way the fluid is almost always retained.

Dr. Collins (closing): Dr. Davis spoke about the use of chewing gum. Some brands will produce a dryness of the mouth. One brand, Sen Sen, I think, contains atropin or something that dries the secretions of the mouth, and it may be that the difficulty we encountered was with the particular brand that was chosen.

Dr. Schwyzer spoke about the mechanical insult by the anesthetizer. We did not consider that in the cases we had. They were all abdominal cases and if it occurred in those it would have occurred in the others. It seemed to be more than a coincidence that all cases followed abdominal operations. We did not have any following a simple appendectomy or a simple ovariotomy, but it did follow in some cases where there was no suppuration at the time of operation.

Dr. Jackson said his cases all came on the ninth day. Some of ours came on the third or fourth and some on the twelfth.

In the series we studied it was more than a coincidence that they were all in abdominal cases where fluids had been withheld, and we had reason to think that it was due to that.

I do not doubt that if proctoclysis is given slowly—we were taught a few years ago to use forty drops a minute—if all the care mentioned by Dr. Harris was taken, good results from proctoclysis would be possible, but it cannot be obtained from routine work in the average hospital, and for that reason I was not satisfied with it.

PROGNOSIS IN HYPERTHYROIDISM

ARTHUR E. HERTZLER, M.D., F.A.C.S.

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The term *exophthalmic goiter* has generally given way to the term *hyperthyroidism* or *thyrotoxicosis,* since careful study has shown that exophthalmos is usually absent, and the goiter may be. The only essential feature in the pathogenesis is, that a toxic product, or possibly an excess of a normal one, is produced. All my patients that have come to operation have shown evidence of organic or tinctorial change, which would seem to indicate that the product is always abnormal. In many of these glands a portion may be normal, and, if a thorough examination is not made, the abnormal portion may be overlooked. The most obvious changes are frequently tinctorial, but nearly always there is, in addition, evidence of a more permanent change, as manifest by round-celled infiltration or changes in cell type or of proliferation on the part of the parenchymatous cells.

There is reason for believing that the tinctorial changes in the colloid are an exhaustion phenomenon due to over-stimulation continued for prolonged periods. This statement seems warranted, for we are familiar with parallel phenomena in other tissues. If this hypothesis is correct the prompt relief sometimes obtained from rest and sedative treatment is easily understood.

The adenoid and papillary proliferation, as well as the round-celled infiltration, may be the secondary result of a perverted secretion due to over-stimulation. Those who are familiar with the pathogenesis of epithelial proliferation induced by sudan III and like drugs will at once perceive a resemblance. The change in reaction on the part of the colloid substance acts as an irritant upon the surrounding tissues, resulting in the changes just mentioned. I have been struck with the parallel changes seen in ovarian cystomas. The glandular and papillary types of goiters are as well marked as in the case of ovarian tumors. In goiters, as in ovarian tumors, the papillary formation exemplifies the greatest deviation from the normal, the glandular the least. In the milder types of goiter there is an increase in colloid which has undergone some changes that result in a changed reaction to stains. The more pronounced cases show, in addition, evidence of cellular irritation. In the pronounced cases of exophthalmic goiter there is an absence of colloid, and the cells assume an active proliferation and papillary formation. These resemble the semimalignant serous cystomas of the ovaries.

Whatever may be the significance of the various cell changes there can be no doubt that when cells have so far departed from their normal morphology they are no longer capable of producing a normal secretion. When a gland has undergone such extensive changes, obviously, the control of those factors which were responsible for the initial changes cannot be expected to produce a prompt subsidence of symptoms.

We do not know the nature of the changes in the secretion, but, if it is the purpose of the thyroid to produce iodine, then certainly the gland is in a hypo, rather than in a hyper, state, for only a small portion of iodine is found in the pathological, as compared with the normal, gland.

As a very general proposition hyperthyroidism may

be regarded as a self-limited disease. The manner in which the self-limitation is reached must vary according to the anatomic state in which they find themselves when regression begins. A subsidence of the dominant features of the disease may not presage a return to the normal state. Most likely it is merely a spontaneous obliteration of the pathological process. Certain types, it can well be understood, may arrive at a state of remission with vastly less change than others. In cases in which myxedema follows there is a spontaneous obliteration. Cases are observed in which there is a curious intermixture of symptoms,—partly hyperthyroidism, partly myxedematous. This bears out, what can be easily proved by sections, the fact that some part of the gland remains normal in nearly all cases. In such cases a spontaneous or operative elimination of the diseased part would allow the remaining unaffected portion to carry on the function in a normal manner. In cases which recover clinically only, to be followed subsequently by a relapse, it is usually some other portion of the gland which enlarges. This phase makes it important to determine when a spontaneous remission occurs, whether or not some other organ, which is in any way associated with the function of the thyroid, was previously diseased. If so this lesion should be corrected lest its continued existence stimulate other portions of the gland to abnormal activity.

That the thyroid is not equally affected has been almost wholly overlooked by surgeons. This is unfortunate, for it is only when the part of the gland that is diseased is removed, leaving the normal part, can the surgeon be said to have cured his patient. Careful attention must be paid to this phase before the surgeon decides on the plan of operation. Gland in hand, the surgeon should be able to say which is the diseased, and which is the normal, part of the gland. The degree of skill which will enable him to make this operating-

room diagnosis can be attained only by careful study of his own material in the laboratory.

In order to appreciate the degree of recovery possible spontaneously, one must follow the patient for many years. I am able to determine that the cases which I saw in my earlier practice have nearly all of them recovered, or, at least, they have ceased to suffer from pronounced thyrotoxic symptoms. However, while most of them, at least, consider themselves well, there is not lacking evidence of an unbalanced somatic system. They continue to be sensitive to certain nerve stimuli, or they react quickly to certain kinds of physical exertion. Whether these conditions are to be ascribed to thyroid or cardiac degeneration is another matter. Some of these patients have suffered from a succession of relapses and, probably, there is no wholly normal gland left. Some, obviously, have a myocardium that is efficient only for a limited degree of exertion. Some still suffer from some other disease which antedated the primary thyroid disease, and in not a few all these things are complicated or overshadowed by a hereditary neurotic or neuropathic state. It is clear that, in order to determine the subsequent state of our ex-patients, we must examine them ourselves. A written communication from them stating that they are "well" is of limited importance.

As in the other self-limiting diseases, our efforts must look, therefore, to the shortening of the process and to preventing a recurrence. Like appdendicitis, hyperthyroidism in running its cycle is subject to certain complications and accidents which must be taken into account. The fundamental factor in the treatment must balance itself against this tendency to complications. Though far simpler and more easily comprehended, appendicitis has not yet reached a state where the universal understanding makes the treatment in all cases less deadly than the disease. This is vastly more

apparent in the management of hyperthyroidism. In the first place, the life cycle of the disease is not generally understood, particularly as relates to other diseases; and the difficulties and responsibilities attending surgical treatment are seldom appreciated until experience has forced them home. If spontaneous recoveries are not complete, operative recoveries in certain cases are no better. This is at least true to the degree that the surgeon may feel that he is not derelict if he hesitates to operate in all his cases of hyperthyroidism. On the contrary, he is open to censure if he does not weigh all factors before deciding on any kind of operative treatment.

There is little in the literature that helps one to solve the many intricate problems. The literature confines itself very largely to consideration of technic and to statistics. Generally speaking, the surgeon who indulges in statistics thereby proclaims himself to be a poor pathologist. We may read that in a given number of cases operated on, x per cent of cases were cured, that y per cent were benefited, and that z per cent were not benefited. Even if these statements were true, they are utterly devoid of helpful information. We are not informed how to determine if a given case will fall into the z class, or we would avoid operating; and we would be chary about operating on patients in the y group, unless we felt quite sure the improvement also implied that we prevented the patient from a yet worse state. If cases could be thus accurately prognosticated, most surgeons would confine their efforts to operating on patients in the x group. Even if we had definite information which would make it possible so to group our patients, the question would come up that, the disease being a self-limited one, surely some of the x group would recover without operation.

The following discussion is based on my own material. The purpose, primarily, is to determine how constantly one can predict the revelations of the laboratory

from clinical examination. If this can be attained it may be possible to separate the patients who do not need operation and those who will not be helped by one from those we consign to operation. Case-histories of such as will illustrate some point vital to the discussion, follow.

In order to reach a clinical classification each patient will be considered as belonging to one of the following categories: (1) those that recover without operation; (2) those that will most likely be cured by operation; (3) those whom operation would not cure, but will benefit; and (4) that group which is not benefited at all by operation or in which operation is too dangerous. These are the questions the surgeon must consider before recommending operation.

In order to facilitate this discussion I shall divide the cases into several groups according to the following outline, together with suggestions as to sub-grouping it seems important to note in some instances. When so grouped it is easier to answer the questions above indicated.

I. Adolescent.
   a. Stable nervous system without other lesion.
   b. Stable nervous system with other lesion.
   c. Neurotic.

II. Adult type.
   a. Normal nervous state.
   b. Normal nervous state with associated disease.
   c. Abnormal nervous state.

III. Typical exophthalmic goiters.
   a. With associated lesions.
   b. Without associated lesions.
   c. Localized changes in the gland.

IV. Secondary.
   a. With associated lesions.
   b. Without associated lesions.
   c. With pronounced myocardial changes.

V. Atypical.
   a. Acute classical hyperthyroidism.
   b. Acute masked.
   c. Chronic masked.

I. *The adolescent type.*—This group must be subdivided according to the physical state and the circumstances of origin. The essential feature is the age of onset. Usually, the patient is from 15 to 25 years of age.

a. The simplest group shows evidence of intoxication after having had an innocent goiter for a period of years. The symptoms are quite parallel to those which follow the excessive absorption of the dried thyroid extract. Sometimes the symptoms of intoxication are slight. This is particularly true in girls otherwise healthy. In the neurotic it is difficult to distinguish the spoiled child from the sick one, unless observation in the hospital is possible. In the former type the lessening of the labors, interdicting music and dancing for a few months, for instance, together with mild sedative treatment, usually produces the desired results. Some of these cases develop while simple adolescent goiter is being treated with iodine or thyroid extract. In such cases this line of treatment must be suspended, and sedative treatment substituted. The results are uniformly good. Those with pronounced dysmenorrhea often are rebellious to any treatment. Hydrastis and iron help some. Operation on either the thyroid or pelvic organs only serves to get both surgeon and patient more deeply in the mire. In some patients small doses of thyroid extract help both the dysmenorrhea and the thyroidism. The dose must be small, and the

results carefully observed. The glandular enlargement in this type is usually moderate in degree, but it is bilateral. In cases in which there is a localized enlargement, particularly if encapsulated, the results of operation are immediate and brilliant.

In this type there are few anatomic changes save a vascularization of the colloid mass with perhaps a lessening of the basophilic characters of its colloid content. In some the cells surrounding the acini may show evidence of loosening, and some show round-celled infiltration and some adenoid proliferation, particularly in the encapsulated forms. It is the more serious forms which show these more pronounced changes.

Case 1.—The patient, aged 23, has always been well. She has had a small goiter for a number of years. Three months ago, while teaching school, she became unconscious, and since that time she has had a rapid heart. Save for a small uniformly enlarged soft right lobe, examination was negative. The right lobe was removed. At operation the major part of the enlargement proved to be well separated from the remainder of the gland. (Fig. 1.) On inspection it showed an increase of colloid, which on microscopic examination showed distinct vascularization with some degeneration and separation of the cells from the basement membrane. (Fig. 2.) The whole picture is that of degeneration, there being little or no evidence of reaction. The larger portion only (Fig. 1) required removal. The result was complete and permanent recovery.

Case 2.—The patient, aged 23, has had a small goiter for seven years. She has been nervous since her marriage, two years ago. She had a small circumscribed enlargement in the lower pole of the right lobe, tremor, and rapid heart. She improved promptly with sedative treatment, but there is a tendency to relapse at times. Here operation would give brilliant results and may confidently be recommended.

Case 3.—Patient, a girl, aged 13. Her mother had dysmenorrhea when a girl, and was operated on a year ago for a myoma of the uterus. The patient has always had good health. A year ago it was noticed that her neck was enlarging. This has continued to the present time. She has a moderately enlarged thyroid gland, which is slightly more pronounced on the right side. The pulse is 78. She received 1-grain doses of thyroid extract twice a day. The gland grad-

ually reduced, and in six months was scarcely noticeable. She had her first menses two months ago, and, though the flow was severe for a week, she had but little pain. During this time and following she was very nervous, and it was noticed that the neck was again rapidly enlarging. The pulse was 100 to 120, and there is some tremor. She was given hydrastis and iron, and the rapid heart and tremor have gradually subsided.

In this group there is no pronounced associated disease, though in these cases there is usually some event that might be ascribed as an exciting cause, as in the cases above noted, but they are of slight importance and their action is not great enough or sufficiently prolonged to vitiate the good prognosis.

b. The second group, usually composed of more mature persons than those of the first group, includes those in whom a goiter appears coincident with or is anticipated by some other disturbance. Perhaps the patients have been reduced by excessive study, or a menstrual disturbance may precede by some years the thyrotoxic symptoms. These patients usually recover with the relief of the underlying conditions. The overworked school girl requires rest and tonics, and the dysmenorrheic requires appropriate treatment. This usually implies sedatives and proper living, rarely operation. The underlying condition usually has existed for a long time, and frequently the condition cannot be improved because of economic reasons.

If there is a distinctly encapsulated adenoma operation may be done with every assurance of success. Even in these cases general treatment should precede operation. Generally speaking, patients of this group usually remain labile, however; and a repetition of the exciting cause may precipitate a new attack. Unfortunately, the recurrences may be more pronounced than the previous one, and an operation may be done in the hope of breaking up the sequence. These cases occur most frequently in individuals whose reproductive functions are still in an anticipatory attitude. The

thyroid bears evidence of excessive or perverted secretion rather than of a direct anatomic change. Possibly this is a response from stimuli received from afar, and when these stimuli cease to act the hyper-secretion subsides. I have too often seen this disease in patients ot this type subside after marriage to be able to regard this as a mere coincidence. Sad awakening sometimes brings a recrudescence of symptoms. The patient returns after a few years laden with the fruits of reproduction, but with a lacerated and displaced uterus. It is now the surgeon's turn to establish a readjustment.

Case 4.—The patient, aged 25, began last June to have soreness and distress in the bowels while undergoing a considerable nervous strain. She got weak spells, and was often short of breath. She was a dysmenorrhea, which is becoming progressively worse. She has recently lost weight. She has a small, uniformly enlarged goiter; the pulse is 120; and there is a marked tremor. Under sedative treatment and rest she recovered. Two years later she complained again of dysmenorrhea and a choking sensation at those times, but not at others. The pulse was 90. She quickly recovered under sedative treatment, and for a year was quite well. At this time she took a severe cold during menstruation. The symptoms became much aggravated, and since then have responded but slowly to general treatment. At the present time she is easily exhausted, and still retains some tremor and tachycardia.

The fundamental factor here is a menstrual disturbance. If this could be remedied the thyroid would be more stable.

Case 5.—The patient, aged 30, has not been well for a number of years. She was nervous and sleepless, and had spells of tremor. She has pain in the groins, hips, and back. The flow lasts from three to four days, but sometimes stops short in the midst of it, and after an interruption of a day the flow returns. The pulse is 100 to 120, there is tremor, and the apex is diffuse and bounding. She has a moderately enlarged goiter involving markedly the isthmus, but no circumscribed nodule can be made out. The uterus is retroverted, lies deeply in the pelvis, and is very tender to bimanual examination. The thyroid symptoms are always greatly exaggerated during the menstrual period.

The uterine displacement was corrected by shortening the ligaments. She slept better, and the pulse decreased to 84, and she gained some weight. After numerous remissions and exacerbations, a partial thyroidectomy was done with some improvement, as after the operation on the ligaments. She still has her ups and downs, though averages better than for many years. She is not quite sure whether either operation was of any great benefit. She is nervous, but does not exhibit it to her friends.

c The final group of adolescents includes those who are distinctly neurotic usually associated with a bad home environment. They exhibit pronounced neurotic tendencies, sometimes even pronouncedly hysterical or epileptic, before the goiter is observed. It is difficult to conclude at just what point the thyroid intoxication becomes manifest. Usually, a record of the pulse-rate and the tremor give the best indication. These patients do badly under any treatment. Even when the thyroid involvement is well localized, and the relief of the thyroid element is quite certain, there still remains the primary neurotic condition, and the patient and her mother will most certainly regard the treatment as having failed. Usually, these patients had best be consigned, first, to a neurologist. He may help them, and at least he serves as a convenient buffer after operation, which, generally speaking, is useless.

II. *Adult type.*—In this type are included those who have attained maturity before the appearance of thyroid enlargement, or, if an enlargement was present during adolescense, it has been in abeyance many years. This type deserves separate consideration because expectant treatment is less hopeful, for often there are associated diseases elsewhere, and, because of the social state of the patient, operation is less objectionable. A scar is less objectionable in a married woman than in single women.

a In this group the patient has been healthy until the advent of the goiter. Many of these patients had

a goiter in adolescence which disappeared, with or without treatment. Usually, without discoverable cause, nervousness and palpitation develop. Generally, the degree of intoxication is not great, though sometimes hyperacute cases are observed. Often these patients are but little sick, and simple treatment suffices. When the enlargement is diffuse, expectancy may become realized. If the enlargement is confined to a sharply outlined portion of gland, operation should be done. In many of these cases there are associated disturbances, but there is not apparent any casual connection or any interdependence. Parous women, naturally, often show pelvic lesions of a minor sort. In this type the onset is usually gradual, and the degree attained not severe. Often these patients come complaining of conditions wholly irrelevant. If they can be given the requisite rest, they often improve satisfactorily. Usually, they are better treated by operation. An effort is made to remove the portion affected. This is generally done when the involved portion is strictly limited. In such cases the recovery is prompt and lasting. When only one lobe is enlarged the removal of it may secure a lasting cure. That a recrudescence of the disease may occur with the enlargement of the other lobe must always be kept in mind. In this type when there is much glandular involvement, with but few signs of intoxication, operation should be done.

Case 6.—The patient, single, aged 37, complains of general weakness, shortness of breath, and nervousness. Previously to a year ago she had always had good health. At this time the symptoms above complained of gradually developed. She now has occasional headaches and choking spells. Menstruation has always been regular and painless. She has lost some weight. The patient has a marked enlargement of the right lobe of the thyroid. She has tremor, and a pulse-rate of 120. The apex beat is diffuse, and the sounds loud but clear. Cross section showed a well encapsulated thyroid lobe (Fig. 3). The microscopic examination showed small-celled

infiltration in the connective tissue, and some proliferation of cells, but little increase in colloid (Fig. 4). The pulse after lobectomy dropped to 80 before she left the hospital.

Recovery has been complete and permanent.

Case 7.—F., aged 23, has always had good health except for some minor diseases of childhood. She has noticed an enlargement of the neck for several years. A year ago she became nervous and had attacks of palpitation. She had a moderately sized, uniformly enlarged thyroid, moderately soft in consistency. There was no pulsation. Eye signs, absent; pulse, 132.

The right lobe of the gland was removed. On section an encapsulated area was discovered, which was not suspected during the operation. The upper pole was composed of large vesicles filled with colloid. (Fig. 5.) The encapsulated portion showed the usual glandular type, which, in some areas, had become infiltrated with blood. The upper portion showed a pronounced increase in the colloid material. This material did not take the basic stains, but on the other hand was slightly acidophilic. It showed vascularization in many regions. The cells were flattened; in some regions there was evidence of protoplasmic degeneration; and in some places the cells were loosened from the septal walls (Fig. 6).

The patient recovered quickly, and has remained well.

Case 8.—The patient, aged 41, has had six children, and had one abortion, twelve years ago. For the past six years she has had tumultuous beating of the heart whenever she becomes agitated. Sometimes she has smothering spells. Despite a good appetite she is losing weight and strength. The menses are regular, slow up two days, stop, then continue again for a day. She has indefinite abdominal pain and dragging in the back. There is a fine tremor of the hands. The heart is not enlarged; the pulse is 125 to 140. There is a nodule the size of a turkey's egg in the isthmus. The uterus is enlarged, retroflexed, and tender; and there is a second degree perineal laceration with rectocele. The nodule was well circumscribed and was readily shelled out. The cut surface shows a uniformly granular appearance. (Fig. 7.) The sections show a small-celled infiltration in the acini and in a few marked colloid increase with vascularization. (Fig. 8.) The pulse came down to 75 on the fifth day after operation.

Recovery was complete and permanent.

b. Cases with associated organic disease.—In cases in which the nervous state has existed and gradually increased before the advent of thyrotoxic symptoms we must search for factors which may have caused it. If such factors are found, they should be removed before the thyroid symptoms are combated. First of all these patients should be relieved of those things which make them nervous. Perhaps relief from the strain of house-keeping may aid in establishing an equilibrium. In another class of cases the pelvic organs are most frequently the source of the increase in nervousness. Uterine sedatives may be useful, and in some cases pelvic operations may be required. Married women with pelvic symptoms resulting from childbirth furnish a large part to this group. A correction of the associated lesion may bring about relief, or a thyroid operation may be advisable. Constitutional diseases or habits may furnish the foundation for pelvic disorders which, secondarily, find expression in hyperthyroidism. These cases are well worth studying, for there is no question but that there is close association between the pelvic organs and the thyroid. These patients nearly all improve under rest, but the improvement is not permanent. If the uterine trouble is pronounced and antedates the thyroid trouble it should receive attention first, particularly if the goiter is small and uniformly enlarged. If circumscribed it is usually well to remove the goiter first.

Case 9.—The patient, aged 34, had one child five years before, and has had pelvic disturbances since. At a pregnancy two years later she had albuminuria, convulsions, and spontaneous premature labor. Immediately following this she developed goiter and extreme nervousness. The cervix was lacerated and eroded, and the uterus was large and sensitive to pressure. The perineum also was lacerated. The pelvic repairs were made, and the patient placed on general treatment. She improved markedly, and for ten years felt well in general, except that she suffered from a rapid heart when suddenly excited, but regarded herself well. Just recently,

ten years after the operation, she has missed her menses, and a recrudescence of all symptoms has appeared.

c. The neurotic type.—This type develops an indefinite train of symptoms on a previously neurotic basis in which the underlying factor is for a long time not suspected. Suddenly a pathognomonic symptom may appear, which clears up the problem. Usually, it is a goiter which, added to an existent tachycardia, makes the diagnosis possible. Eye-signs are usually absent. In cases where the observer suspects, but cannot prove, hyperthyroidism, aid may be derived because of their susceptibility to epinephrin and thyroid extract. The former gives evanescent increase of symptoms, not always easy to recognize. The latter must be used with caution because its use may make the patient permanently worse.

These patients seldom have large goiters. Those who have had adolescent goiters may show considerable enlargement. They are non-pulsating and uniform in size, sometimes with the right lobe predominating. They may be small, doubt being entertained whether they are enlarged at all or not. In those cases in which a goiter has long existed it is well worth while carefully to study the patient's state before the advent of the suspected hyperthyroid symptoms. The presence of goiter may mislead one into diagnosticating goiter when the condition may be a true neurotic or a positive mental aberration. Such patients may become increasingly nervous, and yet not show definite hyperthyroid symptoms. Such patients should be placed in a hospital for a week or two for observation. In such cases a pulse-curve may be of importance. This curve may simulate the defervescent temperature curve in typhoid fever. In such cases the presence of tremor is the most important sign, the two taken together warranting a presumptive diagnosis. One sometimes sees these con-

ditions in women who have been ovariotomized. In these the conditions are doubly complicated and wholly without relief by any means. One is often persistently urged to operate in the desperate hope of finding something which will relieve the afflicted patient and the long-suffering family. These cases differ from the adolescent neurotic with hyperthyroidism, for time usually has brought minor complications and efforts at cure have added to the original burden.

Case 10.—The patient, a woman, aged 35, had one child twelve years ago, and one abortion at three months five years ago. Since the abortion, five years ago, she has had headache which extends from the nape of the neck down the spine. These headaches were so severe as to require morphine four years ago, when she had nervous prostration for four months. She now has headaches twice a week. She is nauseated, but never vomits. At the beginning of the attacks she has tenderness at the base of the brain and on the top of the head and tingling down the finger-tips. The menses are regular, but scant with moderate pain in the lower abdomen. The flow lasts a few days, stops, then starts again. The headaches are most severe at the close of the flow. She weighs ninety-five pounds, which is much under her usual weight. The bowels move five times a day unless controlled by an opiate. She had an operation eight years ago for retroflexion, and had the right kidney anchored five years ago. She has choking spells when first lying down. She sleeps indifferently despite the fact that she takes 0.8 grain of morphine per day. She says her mother always has been nervous and that she herself will always be so too.

The patient greets the examiner with a "I-defy-you-to-cure-me" expression. She is sensitive wherever touched, and one instinctively touches her lightly. She had a medium-sized, uniformly enlarged thyroid, the date of the genesis of which she does not know. It is firm and movable. There is a fine fibrillar tremor, but no eye-signs. The pulse-rate is 126; the apex-beat is bounding and diffuse. The right kidney is movable, the uterus is retroflexed and tender, and the cervix eroded.

The remittent menstruation and exacerbations of the headache at this time suggest an endometritis and, save for the pronounced character of the neurotic symptoms, would demand correction of the uterine trouble. The symptoms of

thyroid intoxication should demand an operation, but, true to her prediction, she will always be a neurotic like her mother.

III. *The typical exophthalmic goiter.*—In the typical exophthalmic goiters, previous nervous states and associated disease of other organs seem to play a less important part than they do in the ordinary cases of thyro-intoxication. Very often there is evidence of general family degeneracy of some sort, either physical or mental, rather than nervous, as characterizes the more simple group. Nevertheless, the thyroid trouble so overshadows the associated conditions that it must receive full consideration first. Attention to associated lesions must be deferred until the thyrotoxicosis has subsided. Usually, the patient has enjoyed a measure of health with perhaps some minor ailment up until the time of the advent of hyperthyroidism. Excessive nervous strain, such as childbearing, trying work in school and the like, may have preceded, but without any attendant nervous state. More or lsss suddenly the patient discovers that she has palpitation and is short of breath, has tremors, and may be troubled with insomnia. She discovers that the neck-bands of her dress are too small; and, in some instances, friends may note the staring eyes. This may all take place within one to six months. Not infrequently the onset is very much more sudden, often following a shock or great grief, but most often without any known cause within a few days the symptoms may be present. In these, the diagnosis, insofar as the naming of the disease is concerned, is made at a glance, but the naming of the disease stops very far short of making a diagnosis.

In these cases, the subsequent course is very variable. In the hyperacute, high fever and delirium appear early, vomiting and rapid emaciation follow quickly, and death takes place in from two to six weeks. No treatment is of avail. I have seen six of

these cases, and I have not the remotest intention of operating on such patients.

Less stormy cases are the more common. The patient develops the symptoms less quickly. There is often fever, not infrequently extreme nervousness, even delirium; emaciation is rapid, often extreme. They have acetonuria, and sometimes a dry typhoid tongue. These differ from the group just mentioned in that after a time the delirium disappears, the fever subsides, and they begin to gain in weight. I tried operation in one of these cases in the vain hope of halting the patient in the downward course. Never again! If treated expectantly patients of this group usually reach a return to normal weight. They can be operated on with a certainty that the road to recovery will be much expedited. The time and character of the operation must be selected with care.

In some of these cases there seems to be an associated or non-suppurating thyroiditis. They present the usual phenomena of excessive local tenderness to touch, the feeling of heat on palpation, and in extreme cases there may be slight hyperemia of the skin. The presence of a true reactive is best appreciated when these patients are operated on. The adhesion between the gland and its capsule is such that separation can be accomplished only after the most painstaking labor, and sometimes the operator is willing to compromise and remove less of the gland than he had originally planned.

The usual run of patients are less acute than those in the group just mentioned. They lose flesh, but never have delirium and but little, if any, fever. As soon as the lost weight is regained, or if no loss of weight occurs, operation may be done with a certain prospect of expediting recovery. In the milder of these cases operation may be done early, and the development of the disease checked. Though the mor-

Fig. 1. The larger circumscribed portion represents the lower pole, in which the chief changes have taken place. The upper portion is relatively unchanged gland. It was needlessly removed.

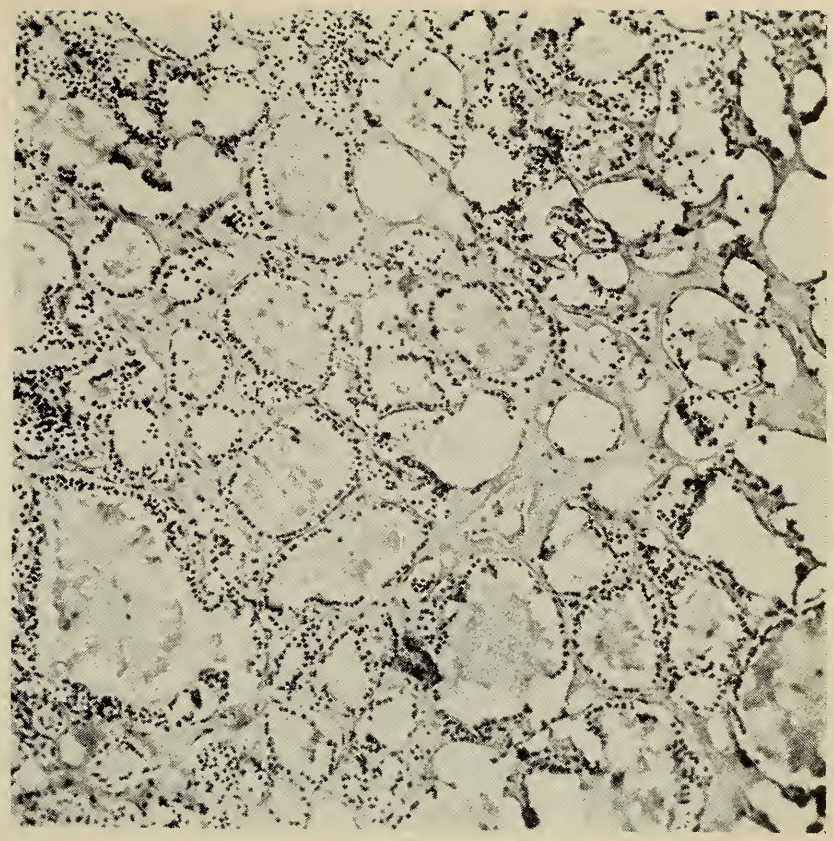

Fig. 2. The colloid is increased in amount and is vacuolated, and has undergone changes in tinctorial reaction. In some of the acini the cells have become loosened, and in others they have entirely disappeared. There is but little cell-infiltration.

Fig. 3. A large encapsulated mass situated in the right lobe. There are numerous small cysts and a large one in it. In the upper portion is an extensive hemorrhagic infiltration.

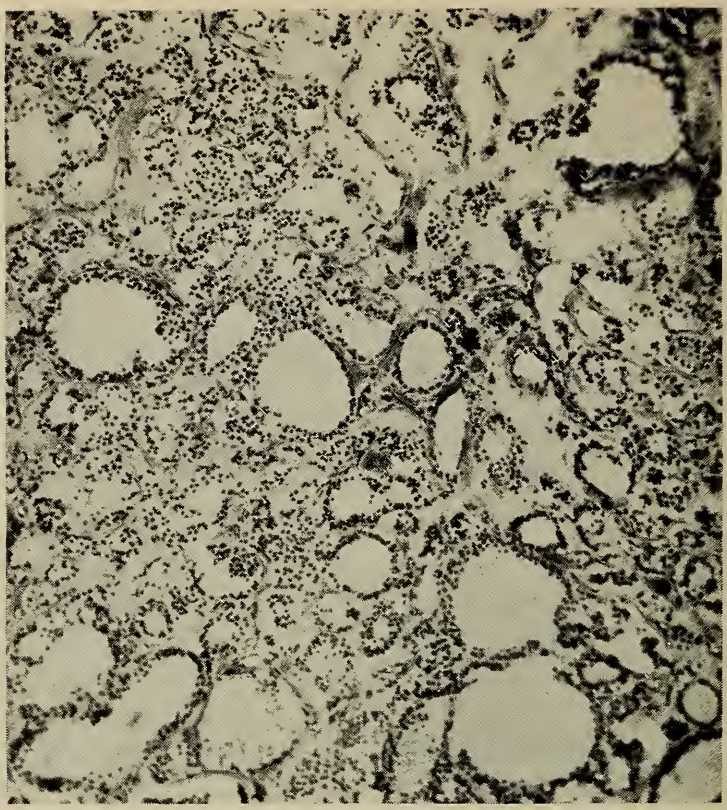

Fig. 4. A section of the preceding shows only a little colloid, but marked increase in the glandular elements, and the cell-infiltration is considerable.

Fig. 5. The figure represents the entire right lobe. The upper pole contained a large colloid cyst, and the lower pole had a granular colloid appearance.

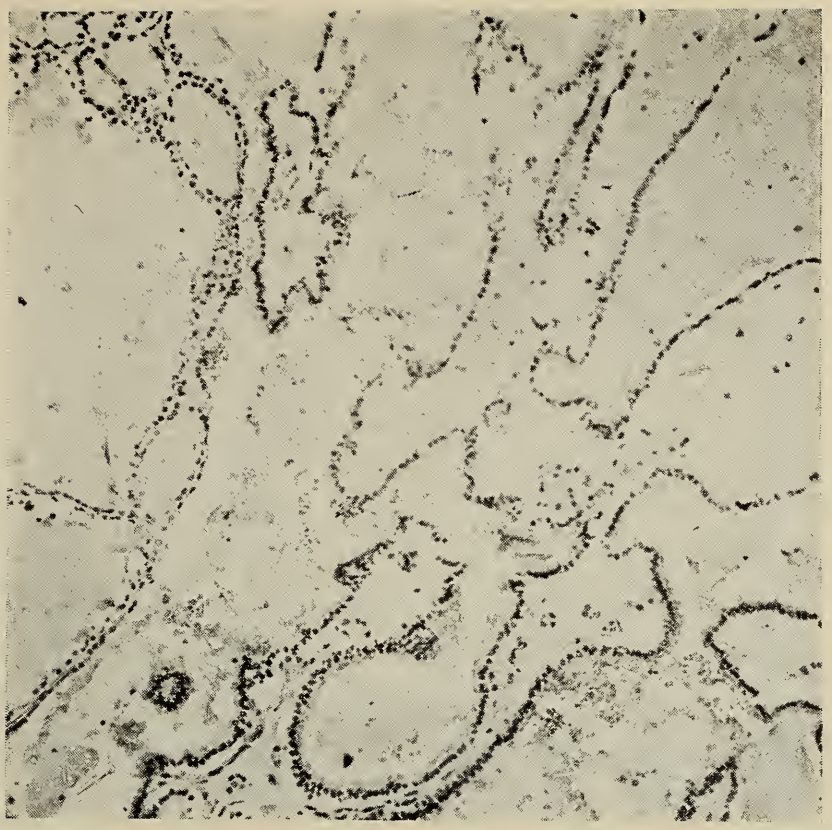

Fig. 6. In harmony with the gross appearance of the preceding the section shows large areas of colloid with extensive vacuolization. The cells are small and thinned, and in some places are entirely loosened and lie in the substance of the colloid.

Fig. 7. This mass was completely encapsulated, and shelled out readily without disturbing the surrounding normal gland substance. The cut surface was of nearly uniform color, and was finely granular.

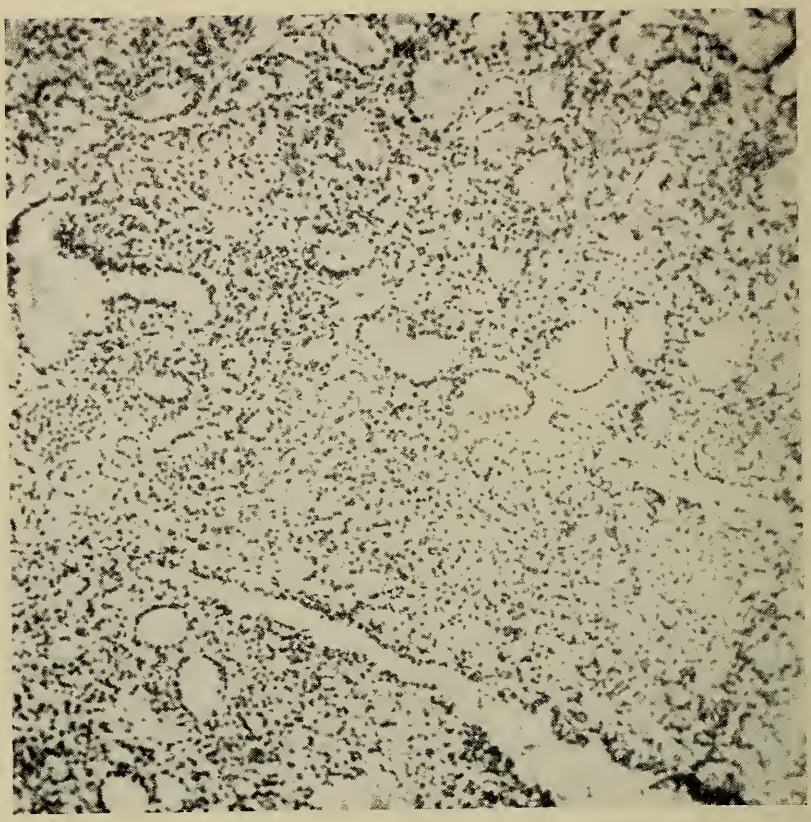

Fig. 8. The section of the preceding showed the mass to be made up of hyperplastic acini with abundant cell-infiltration, but with little colloid.

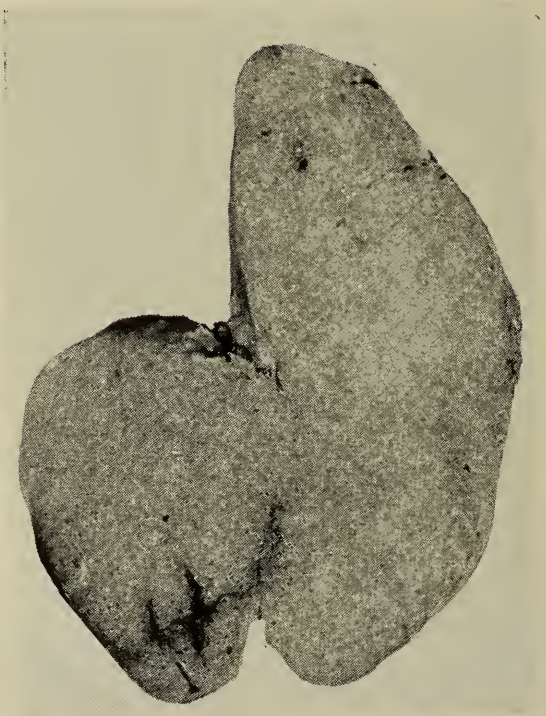

Fig. 9. The right lobe and isthmus are of uniform glandular appearance, being of coarse granular appearance.

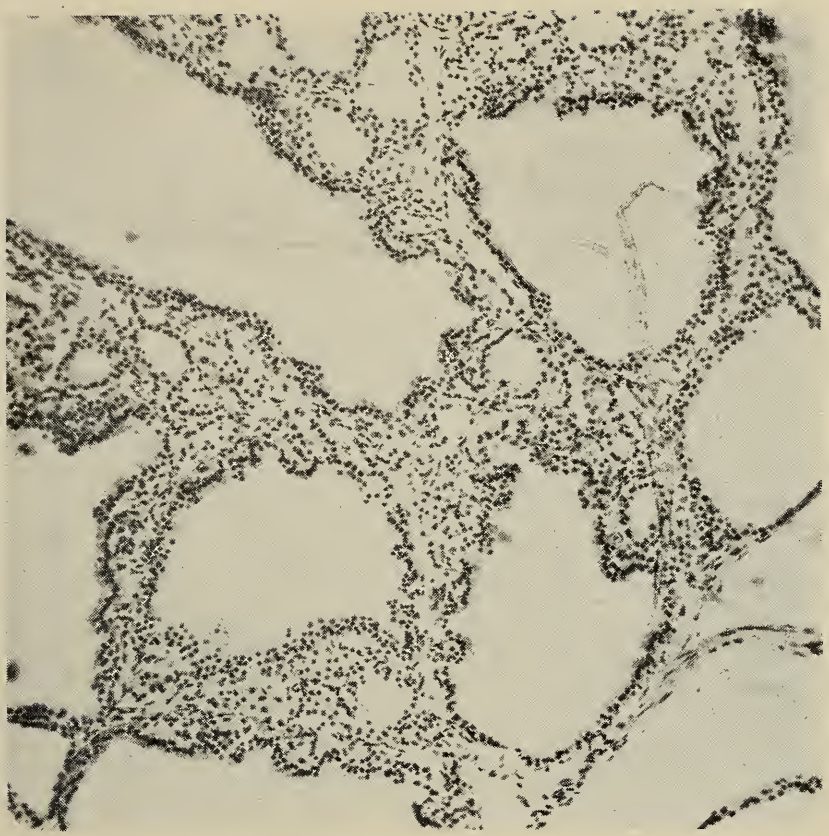

Fig. 10. A section of the preceding shows large acini with marked papillary proliferation of the walls. This is the usual picture of true exophthalmic goiter.

Fig. 11. The mass of this specimen is made up of areas presenting various types of degeneration. The outer rim presents a fine granular, colloid appearance.

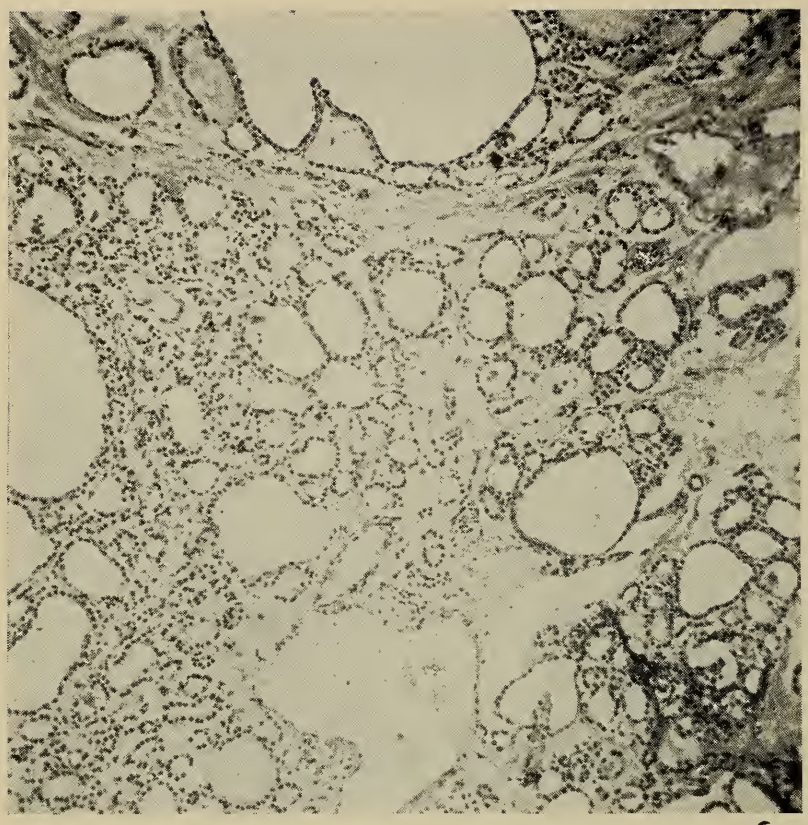

Fig. 12. The section from the above-mentioned zone shows adenoid proliferation with a few enlarged acini. The remainder of the gland was completely degenerated, chiefly colloidal and hemorrhagic. The border, obviously, was the cause of the toxic symptoms.

Fig. 13. A cyst the size of an apple occupied the lower pole. The gland as a whole was fragile and relatively avascular, and large colloid points could be made out.

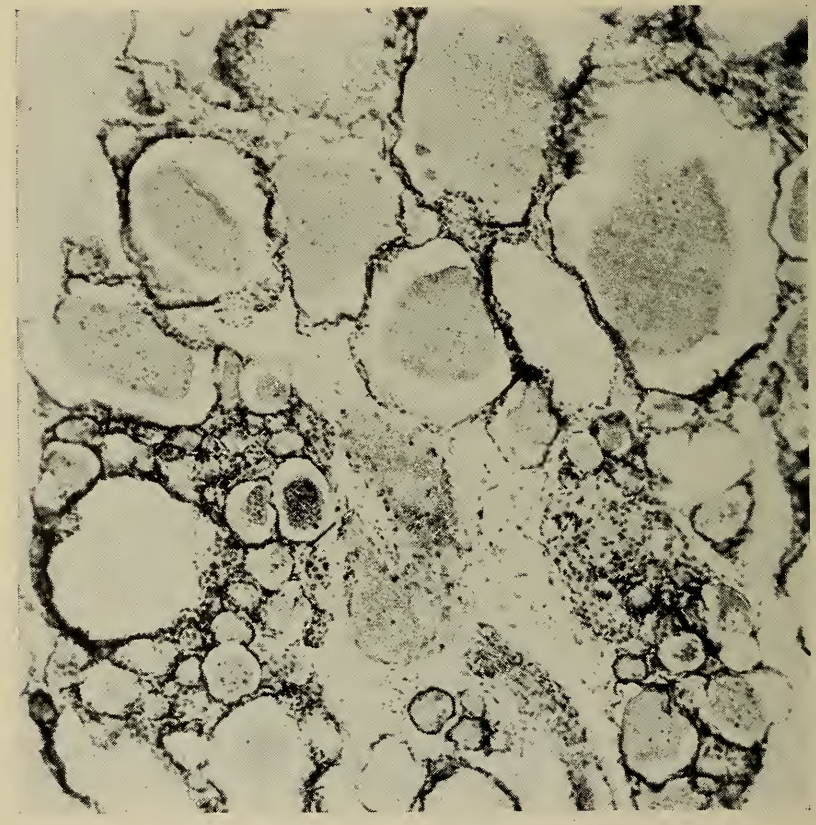

Fig. 14. The cells in the large acini show regressive changes, and between them are evidences of glandular proliferation.

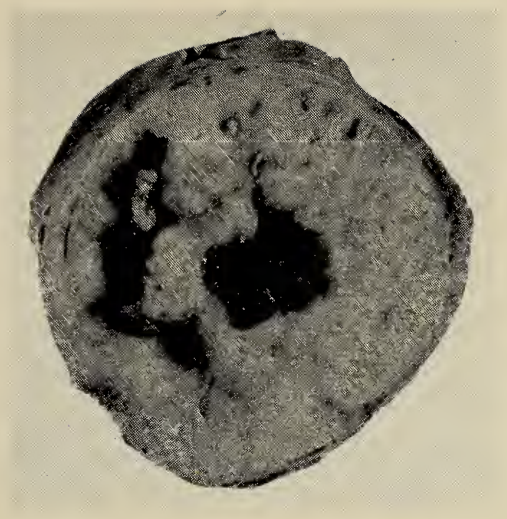

Fig. 15. The mass contained several cysts in the interior. The remainder was firm to the touch and of uniform color. It was completely encapsulated.

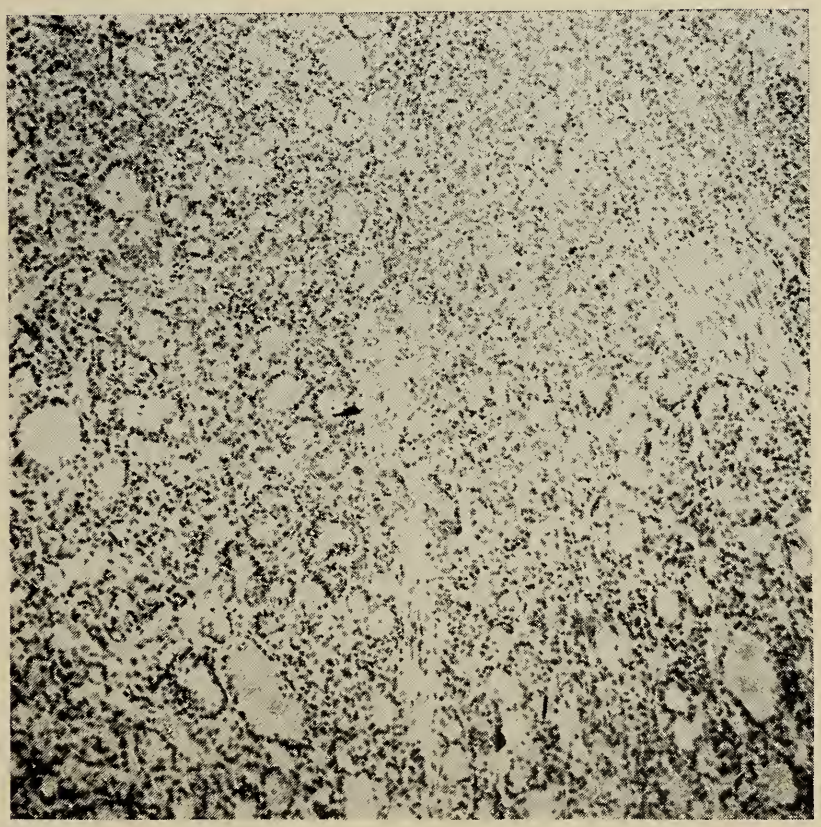

Fig. 16. The section of the preceding shows an increase of the ascini and but little colloid. This specimen represents a fetal adenoma that has long slumbered.

tality is small there is always the risk of a stormy scene during the first day or two. If one fears this he can ligate a vessel or two, thereby anchoring the patient to him, thus assuring obedience to his suggestions for subsequent treatment. That pole-ligation is an innocent procedure is denied by those who have had much experience with it. The mortality, even in competent hands, rivals that of lobectomy. I doubt very much if this can be true when the operation is done under local anesthesia. If the patient is free from acetone, and has no fever, this operation may be done nothwithstanding the patient is much emaciated. As to any direct benefit from the ligation per se one may well entertain a doubt, except in those cases in which there is a strongly pulsating gland. In these the superior thyroid arteries are felt as distinct pulsating cords. Not infrequently these can be directly seen. Ligation in such cases is commonly followed by a prompt gain in weight and other evidences of improvement.

If one lobe only is enlarged early radical treatment is less dangerous than if both lobes are equally enlarged, and success is much more certain. If both lobes are equally enlarged, improvement is likely to be only partial or temporary, and the patient must be told that further operation may be necessary. Even when one lobe only is enlarged or predominantly enlarged and the improvement is prompt and satisfactory, the patient must be told that the other lobe may enlarge at some future date and require operation. If this does occur it too must be operated on. In such an event it is expedient to reoperate early unless a brief trial at sedative treatment proves promptly efficacious. When both lobes are enlarged a partial removal of both lobes may be done at one sitting, but this increases the risk. For this reason I prefer to operate on one lobe at a time. The degree of risk is determined by the degree of toxicity.

In some cases with exophthalmos the enlarged part is circumscribed even encapsulated. When completely encapsulated the mass is usually situated in the isthmus, less often in the lower pole of the right lobe. These represent fetal adenomas that have suddenly taken on activity of growth and obviously of secretion. In such cases the results of operation are brilliant. All symptoms save the exophthalmos vanish at once after the offending mass is removed. In the majority of cases of encapsulated goiters with intoxication, however, there is no exophthalmos.

The true exophthalmic cases are characterized by true proliferation of the gland substance. Instead of its being an increase of the acini or the multiplication of the glands in fetal adenoma there is a genuine papillary proliferation, resembling that seen in serous ovarian cysts. The proliferation may be so pronounced as to mislead the unwary into diagnosticating malignancy. No case has yet been reported in which true malignancy was associated with exophthalmic goiter.

Finally, it must be noted that the most carefully conducted operative procedures may fail to secure the desired results. Expectant treatment may rival in results those achieved by surgery, but the latter under favorable conditions may secure in months what the former can attain in years. Besides, surgical treatment does much to prevent relapse, cardiac degeneration, and the rare, but disastrous, hyperacute termination.

Case 11.—The patient, a woman, aged 28, has one child six years old, and has had three abortions. She had a hard labor, and soon afterward she noticed that her neck was enlarging. She became nervous, and had palpitation. She received a fright when the barn burned. Soon after it was noticed that her eyes had become staring. She has lost thirty pounds.

She has a marked exophthalmos, pronounced Kocher, Graefe, and Dalrymple signs. The pulse is 120 to 150, full and quick, the apex is diffuse and is extended lateralward and downward. She has a medium-sized goiter, which is soft,

markedly pulsating. The uterus is large, retroverted, lacerated, and tender, and there is a second-degree perineal tear. Pole ligation was done and her weight was regained, and the nervous symptoms considerably improved. Four months later a lobectomy of the predominating right side was done. She declares herself well, but the heart is still unstable, and she is easily excited and the exophthalmos has subsided but little. The pelvic lesions should now be corrected, but she finds herself so much improved that she does not mind the headache and backache.

Case 12.—A man, aged 30. He has been sick three and a half months. He complains of shortness of breath and a weakness of the knees. The trouble with his legs has been so marked that he had to quit work, for he never knew what moment he might be precipitated to the ground. The lungs and legs were negative on examination. The pulse was 120, full and bounding. The apex-beat was diffuse. There was marked tremor. There was a moderate exophthalmos, but no other eye-symptoms.

A right lobectomy was done. The man improved promptly, and in two months was able to do normal labor. Eighteen months after the first operation he reappeared with a repetition of his complaints. He had lost twenty pounds in six weeks. He has an elarged left lobe, exophthalmos, and a well-developed Graefe. Two-thirds of the left lobe were removed. Improvement has been as prompt as after the first operation. The gland showed a uniform structure, which (Fig. 9) on section presented a papillary proliferation of the epithelium. (Fig. 10.)

IV. *Secondary hyperthyroidism.*—In this group may be included the patients who have long had an "innocent" goiter, annoying only because of its disfiguring effect. These patients are normal in every way, at least are not conscious of nerves. They are, most frequently, women past middle life. Gradually, they develop dyspnea, at first, perhaps ascribed to pressure from the enlarged gland; then come rapid heart and tremor. They rarely have eye-signs. This type is apt to have dilated hearts. It is not easy to distinguish the rapid heart of degeneration from that of intoxication. Generally speaking, the toxic heart is most rapid in the morning even when the patient

is kept in bed, while in myocardial degeneration rapidity increases with exertion. Often in the latter, direct evidence of myocardial degeneration may be discovered. Myocardial degeneration may antedate the other symptoms of toxic goiter. The "innocent" goiter, apparently, gradually destroys the heart-muscle before the symptoms of intoxication appear. At any rate, serious myocardial degeneration appears earlier than after the other forms of the disease.

The importance of an exact differentiation is found in the fact that a myocardial degeneration does not disappear after the subsidence of toxic symptoms. Furthermore, patients who have myocardial disease and subsequently develop toxic symptoms usually die soon from progressive myocardial weakening, no matter what the treatment.

On the other hand, the patient with cardiac signs, even with considerable dilatation, but without much change, when the offending thyroid is dealt with, recovers promptly. Generally speaking, symptoms of hyperthyroidism are relieved by operation in proportion to the degree of localization of the process. In adenoma the symptoms disappear at once, including the cardiac hurry. Fortunately, often these patients have had one lobe predominately enlarged so that it is possible to get rid of most of the affected portion by operation. This type should be operated on early. Not infrequently these patients have marked pelvic disturbance, but the cure of the pelvic lesion has no effect on the goiter. My practice in these cases is to do the pelvic operation first under ether, and the goiter operation a week later under local anesthesia. I am perfectly willing to give these patients ether for the pelvic operation, but not for the goiter operation. In this way the patient can have both conditions relieved by a stay of two or three weeks in the hospital.

In structure, these goiters are colloids, and differ from classical colloids only by the change in tinctorial

reaction, vascularization, and sometimes round-celled infiltration. It is important to note that usually but a small part of the gland is involved, and, unless the examiner is persistent, the affected portion may be overlooked. These never show much gland-proliferation, and never papillary formation. This fact accounts for the absence of eye-symptoms.

Goiters which exist for a long time are not innocent unless they have become calcified. Unless they do this, while they may not become toxic or undergo malignancy, they may have a deleterious effect on the heart muscle. How much we may do toward preventing these changes by operation is dependent on how much of the offending portion of the gland we may be able to remove.

Case 13.—This patient, aged 55, had three children and no miscarriages, and passed the menopause two years ago. For several years prior to passing the menopause the menstrual flow was irregular and excessive. She had had a goiter for thirty years. It grew slowly until four years ago, but since that time it has not grown. Since the menopause she has had nervous spells and palpitation. The goiter seems sensitive at times and seems to disturb her respiration. Her sleep has been somewhat disturbed. There is a moderate, fine tremor. The thyroid isthmus shows a mass as large as a goose egg (Fig. 11), and a smaller nodule in the upper pole of the right lobe. The section showed glandular proliferation. (Fig. 12.) The pulse is 86. The nodule was removed. The disturbance to respiration seemed the only certain indication. The removal of the nodule resulted in the prompt and complete subsidence of all complaints. It seems fair to assume, therefore, that the part removed was exerting a mild intoxication. This assumption is substantiated by the evidence of proliferation as seen on microscopic examination.

Case 14.—A woman, aged 36. She has had enlarged thyroid for many years. She was never conscious of any disturbance from it. A year ago she became nervous and trembly. The pulse is 100, and she has a marked tremor. She has lost a little weight, but feels weak out of proportion to the amount of weight lost.

A right lobectomy was done. She left the hospital on the fifth day with a pulse of 80. She was completely relieved of

all her symptoms. The specimen showed a cyst as large as a small apple in the lower pole. (Fig. 13.) The section showed cellular activity and increase of colloid. (Fig. 14.)

Case 15.—A woman, aged 53. She had one child twenty-five years ago, and passed the menopause five years ago. She first noticed her goiter eighteen years ago. A year ago she had pain in it for the first time. She has quite a difficulty in going to sleep. She is exceedingly nervous, and worries a great deal though, according to her own statement, she has nothing to worry about. She has night-sweats and has lost considerable weight. The pulse is 96, and there is marked tremor of the hands. There is a well circumscribed tumor, the size of a small apple, in the isthmus. The tumor was removed. (Fig. 15.) On section it proved to be a fetal adenoma. (Fig. 16.) The pulse dropped to 66 before she left the hospital, and her other symptoms were relieved. The tumor contains several cavities filled with straw-colored fluid. The remainder is whitish-pink and granular. On section this is seen to be adenoid tissue.

V. *Atypical.*—In this group those cases may be placed which, because of their course or form, depart widely from the usual. One may observe them many months, even years, before a definite diagnosis is possible. They may present the general symptoms of the neurotic. The one dependable clew is that they lose weight, regain it, and lose it again. A typical neurotic does not do this. The toxic cases likewise, when placed in bed, often show a high morning pulse with a lower one in the evening, though at no time is the pulse high enough to designate it as tachycardia. For instance if a patient with a pulse of 80 at a number of examinations, be placed in bed, the nurse may find 90 to 95 in the morning hours before it is time for the doctor to make his rounds. If, in addition to this, there is tremor the diagnosis is strongly presumptive. Often in such cases a thyroid enlargement or eye-signs may reward the astute observer for his pains. Operation does these patients no good, but they recover unless a too doting family too thoroughly convert them to the joys of invalidism. This type is

often operated on, and reoperated on without noteworthy results. Every thing about them is defective, and one cannot make a plus by taking yet more away from a minus. In these cases, more than in any other type, one must study the state of the patient before she becomes sick. In these cases it is well to consider carefully the family history. The life history of the mother may presage the subsequent history of the daughter with greater accuracy than we are able to do by the application of the fine points of our art.

In another group, fortunately small, an exact diagnosis may never be possible. The small, hard thyroid, possibly existent for many years, may be palpated if it is sought for. The patient may be a confirmed neurotic, presenting a complete picture of neurosis. Often, if one searches the past history, he may receive a clew. True neurotics are congenitally introspective and selfish. If, in the absence of such a history, the general symptoms of an indefinite neurosis develop the possibility of an endocrine disarrangement must be kept in mind.

Case 16.—Mr. M., aged 52, has always had good health until five weeks ago. Without known cause he began to feel worn out, and had palpitation of the heart. The palpitation is made worse by excitement rather than by exertion. His sleep has been much disturbed by nervousness.

When he entered the hospital he had a pulse of 106; temperature, 100°, respiration, 30. The lungs and abdomen were negative. The apex was outside of the midline, and the heartbeat was diffuse. The right border was near the midline of the sternum. The mitral sounds were somewhat muffled, but there were no murmurs. The leucocyte count was 9,000.

Because of the persistent low temperature and the heart-findings a probable diagnosis of endocarditis was made. The significance of an apprehensive nervousness was entirely overlooked. Rest in bed for several months was attended by general improvement. He returned in two months in much the same condition as on his first entrance. He had at this time Kocher and Stellwag signs, rendering the diagnosis easy. A month later the right lobe of the thyroid was found

to be enlarged. The enlargement remained for six weeks, and then gradually disappeared. The disappearance, on the contrary, was attended by greater nervousness, which increased to actual mental disturbance at times. He subsequently improved and returned home, where he had a rather sudden exacerbation and died.

In approaching the study of the therapeutics of goiter it is helpful to have observed cases untreated in order to obtain a knowledge of the life history of the disease. If one has not had this opportunity it may be obtained in a measure by reading the earlier literature. The young man is too apt to assume that whatever good follows his efforts must have come because of such efforts, and, if disaster is averted, it must be because of his efforts.

It should be ever kept in mind that the general tendency is toward recovery and that many recover spontaneously. Recovery may be expedited by judicious operations. The time for operation must be carefully selected, and the operation chosen must be commensurate with the resistance of the patient. Above all, the operator must always hold the fact before himself that his operations must be without mortality, lest his therapeutic endeavors prove a greater menace than the disease.

Just what operation shall be done is a matter of judgment. In pulsating goiters preliminary ligation is useful. In large rapidly developing goiters improvement follows as it often does from mere rest in bed. In the small extremely toxic variety I do not believe ligation does any good at all. If one lobe is predominantly enlarged or if there is a circumscribed nodule, extirpation of this portion is usually sufficient. In uniformly enlarged goiters a wedge may be taken from each lobe if the condition of the patient is first class; otherwise it is well to take two bites at it.

FOR DISCUSSION SEE PAGE 101

THE SURGICAL TREATMENT OF EXOPHTHALMIC AND THYREOTOXIC GOITER, WITH SPECIAL REFERENCE TO BILATERAL RESECTION

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There is no subject in the category of medicine about which there is so much diversity of opinion between internist and surgeon, as there is in the treatment of exophthalmic goiter. There is, moreover, no uniformity in procedure, as to operative indications and operative technic, among surgeons themselves. The whole subject seems to be in a chaotic state, and this, no doubt, is due to the fact that the actual etiology of the disease is still unknown.

McCarrison[1] says "there is no definite proof that the cures effected by surgical means (that is, by hemithyroidectomy alone, or with ligature of arteries) are more lasting than those effected by medical means." He has done excellent work on diseases of the thyroid, and has pointed out the importance of searching for focal infections; but, without minimizing the importance of these infective foci as etiological factors of obscure diseases, how often one finds that, even after all are removed, these cases are not cured, and, conversely, it is seldom that one finds exophthalmic goiter associated with extreme oral sepsis, infected gallbladders and appendices, or profound intestinal stasis.

Medical treatment in Graves' disease has not been eminently successful. Thus Sattler[2] estimates the mortality at 11 per cent. In Hector McKensie's[3] experience the mortality has been about 25 per cent, and others report as high as 30 per cent. The large percentage of uncured cases from medical treatment is also discouraging. Kuttner[4] traced nine patients who had been under medical treatment for fifteen years, but not one had recovered health. In Osler's System of Medicine the statement is made that it is a disease from which few recover and some die.

While medical treatment has made little advancement, surgical treatment has progressed steadily. Osler[5] says that the removal of the thyroid gland offers the best hope of permanent cure, and he quotes the statistics of Kocher and the Mayos giving the operative mortality below 4 per cent, and cures of some 70 per cent. Forchheimer,[6] while stating that the physician who recommends operation in Graves' disease should at least have exhausted all other means of treatment, says that operative procedure on the thyroid gland, as a logical and scientific mode of treatment, is fully admitted.

It must be admitted that there is a certain percentage of cases that are cured, and remain cured, by medical treatment alone. Thus we have Hale White's[7] analysis of two hundred hospital and private cases investigated over a period of twenty years, one hundred and two of which were traced, and of these he gave the cures at about fifty per cent. This leaves a margin of uncured who finally look to surgery for relief.

Among surgeons there is no unanimity in opinion regarding the surgical procedure. Thus Rogers[8] claims 70 per cent cures from ligation of the four thyroid arteries. Walton[9] says that hemithyroidectomy is the operation of choice. Others, as Kocher, the Mayos, and Ochsner, do a lobectomy with or with-

out partial resection of the remaining lobe. Donald C. Balfour,[10] in pointing out the advantages of bilateral resection in simple goiter, says its field of usefulness is very limited in the exophthalmic type, while Halstead[11] advocates bilateral resection as the method of choice with or without preliminary ligation of one or more arteries as the case might indicate.

Since 1912 I have done bilateral resection on thirty-one cases of true Graves' disease, or cases with positive symptoms of hyperthyroidism where both lobes of the thyroid were enlarged. All patients operated on that did not have definite tremor and tachycardia have been excluded. There was no operative mortality in this series. My operative mortality for goiters of all types was one. This was one of my earlier cases of Graves' disease in which a single lobe was resected. It was done before the patient had sufficiently recovered from an exacerbation of symptoms. One patient died following an injection of boiling water into the gland. This was an extremely severe type of the disease. The patient was a young girl, and had been ill over five months. She had an enormous appetite, marked tremor, pulse-rate 150 to 160 per minute and flushed skin. After three months' absolute rest in bed and expert medical care under two of the best internists, improvement was very slight. Ten c.c. of boiling water were injected into each lobe of the gland. In the afternoon the patient was vomiting and the pulse-rate increased; on the third day the heart began to fibrillate, and she passed away on the fourth day.

Preparatory treatment, such as absolute rest and medical care, preceded every operation, and in some cases there were injections of boiling water into the gland, as advised by Miles Porter,[12] followed by ligation of vessels. In a few cases after prolonged rest when the toxemia seemed to be well controlled,

bilateral resection was done without preliminary ligation. In some of my earlier cases a unilateral resection was done, and the remaining lobe dealt with later when relief was found to be incomplete. Two of my patients who were operated on in this way some years ago and were not completely relieved, have not returned for a second operation, although advised to do so, and I still think that in certain mild cases, especially where the enlargement of the thyroid is asymmetrical, the first operation should be limited to one side. This rule, I think, can be laid down as absolute in those thyreotoxic goiters associated with adenoma or cyst of one lobe. In most of my later cases where there were well marked symptoms and in which there were one or more severe exacerbations of toxemia, bilateral resection was done at one operation. This has been more satisfactory, the cure more positive, and the patient saved the annoyance and inconvenience of undergoing a second operation.

Halstead[11] says that in several instances in which the ligation of three arteries, plus the excision of one lobe, has been attended with almost negative results, relief from all symptoms followed immediately upon removal of most of the remaining lobe.

It is frequently asserted that, as a result of operation, a condition of myxedema may follow as an early or late sequela. But, as Dunhill[13] says, the operation is being performed extensively, and many critical eyes are watching results; and any case occurring could scarcely escape observation. Personally, I have never seen such a result. No report to my knowledge of a case has as yet been recorded in the literature, nor do I know of a case being presented at a medical meeting. Conversely, cases are reported, and I have operated on such, where sufficient gland had not been removed. McCarrison[1] records one case having recrudescence of symptoms after operation, but does not

state the type of operation done. It is obvious from the picture he shows that an enlarged lobe still remains.

In estimating the amount of gland to be left for functional purposes I have been guided by the research work of the University of Minnesota, where it has been found that one-sixth of the gland is necessary in the adult, and one-third in the growing animal. This, however, applies to normal glands, while, clinically, patients with exophthalmic goiter seem to do well when very little of the thyroid remains. In severe cases I have aimed at leaving the minimum amount of one-sixth of the gland, but in some of the less severe types somewhat more than one-sixth has been left. Many of the cases here recorded have been observed over a number of years, but not the slightest sign of myxedema or hyperthyroidism has been noted in any of them.

In cases of Graves' disease without obvious enlargement of the thyroid the change from the normal is more microscopic than macroscopic,—in other words, although the gland is not visibly enlarged, it has the same histological characteristics as in the cases where there is obvious enlargement. It has the same solid, fleshy appearance in gross section, and, microscopically, shows hyperplasia of the cellular elements. The treatment in these cases should therefore differ in no way from those where definite enlargement is present, and one cannot see why Dunhill[13] advises against operating on them. He suggests that the cells are so closely packed that they will die from mutual pressure, and that the gland will later atrophy.

One of my cases was diagnosed exophthalmic goiter, though the eyes were not unduly prominent, and absolutely no enlargement of the thyroid could be made out. There were tachycardia and tremor for several

months. Six months later the thyroid was distinctly larger than normal.

The patient had a successful resection of both lobes in two stages. I saw this patient two years later, and her general health was good, though she was a sufferer from chronic pelvic trouble.

Though many of the patients presented themselves in a condition of pronounced toxemia, few were in so bad condition that with rest they were not sufficiently improved to undergo operation later. Two patients were practically moribund when first seen by me. One had declined operation of any sort some time before, and died from the disease a few days later; another died the day after admittance to the hospital. It cannot be emphasized too strongly that the time to operate may not be when the case first presents itself. In one instance the patient reacted so severely to injections of boiling water that operation was not considered until several months later, when a preliminary ligation of the inferior thyroid under local anesthesia was done, and both lobes resected two weeks later. In neither of these operations was there any reaction compared with that following the injection of boiling water.

One patient was certified insane, and was on his way to an asylum when his real condition was recognized by Dr. E. J. Coulter, who asked me to see him. We did a preliminary ligation of both superior thyroid arteries, and two weeks later bilateral resection. Recovery, both mental and physical, was rapid and complete. The patient returned to his farm, and has been able to do his normal amount of work for over two years.

Another patient had a ligation of the right inferior thyroid under local anesthesia. There was so marked reaction that no further operation was advised until the patient had at least three months further rest. She

improved so markedly in that time and seemed so perfectly well that no further operation was advised for the present. The case does not, therefore, belong to the series here recorded, but no doubt would have been in the series had the symptoms persisted, and it may yet, should they return. As the thyroid is not a functionless organ, like the appendix, we cannot conscientiously advise its removal after its first offence.

One of the advantages of ligating the inferior thyroid over the superior is, that the incision is in the same line as that for resection. Its chief disadvantage is that the operation is more difficult.

TREATMENT

All treatment to be rational should be based on pathology. The surgical treatment of exophthalmic goiter is based on the theory of thyroidal auto-intoxication. Murray[15] says: "We do not as yet know the actual exciting cause of the special proliferative changes which are found in the thyroid gland in exophthalmic goiter. Whether further research should prove exophthalmic goiter to be a hypersecretion or an altered secretion of the thyroid or only one phase of a complex disturbance of the functions of other ductless glands, one fact remains, that the thyroid is never found normal microscopically in cases showing the symptoms of exophthalmic goiter (Kocher[16], Berry[17]), and that removal of the gland gives positive beneficial results, which results are often in direct ratio to the amount of gland removed." "Even the extreme advocates of the new theories ascribe the chief rôle in this disease to increased activity of the thyroid."

If we accept the foregoing, why then are so many physicians opposed to surgical treatment? The reasons seem to be the former high mortality following operation, failure of complete cure from inadequate

operation, and the fact that a number are apparently cured by medical treatment alone. These arguments I think are fully answered in this article.

Indications for operations.—Have we exact indications as to when or at what stage operation should be undertaken?

Recognizing that there is an ebb and flow in the symptoms of exophthalmic goiter, it is most important to time the operation to the stage of remission, and not during the acute exacerbation. No doubt in the past the high mortality from operation in Graves' disease was due to the fact that patients came to the surgeon at the height of the paroxysm. Sufficient stress has not been laid on the time at which operation should be undertaken. Plummer[18] says that the time to operate is early in the attack or late, when symptoms have passed the crisis. I have had no personal experience with operating early in the attack, and it seems to me that more statistics should be available before one can say that operation is as safe then as it is when the attack has subsided. In all my cases I have employed rest and medical treatment until the acute stage has passed. No matter how severe the case, the first line of treatment should be absolute mental and physical rest, combined with medical care; and the severer the symptoms the stronger should be the adherence to this rule. I would like to emphasize the fact that I consider that exophthalmic goiter should never be considered a surgical emergency.

As already mentioned, medical statistics show that probably 50 per cent of the patients recover entirely without the aid of surgery. It would, therefore, seem that in the first stage surgical treatment should not be considered, but medical treatment employed, and operation should be done only when symptoms again recur or persist for a prolonged period. Again, were

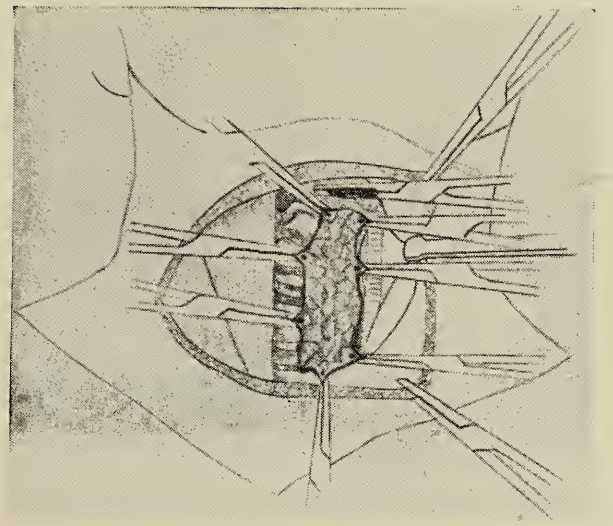

Fig. 1. The right lobe has been resected, and the sternohyoid and sternothyroid muscles fall back over the remaining part of the lobe. On the left side the superior hyoid vessels are clamped, and clamps are applied to the vessels as they pass from behind in the capsule of the gland. The part of the lobe anterior to the clamps has been cut away. Bleeding from the cut surface is controlled by an over-stitch.

Fig. 2. Both lobes resected and the remaining parts of each lobe allowed to fall back beside the trachea.

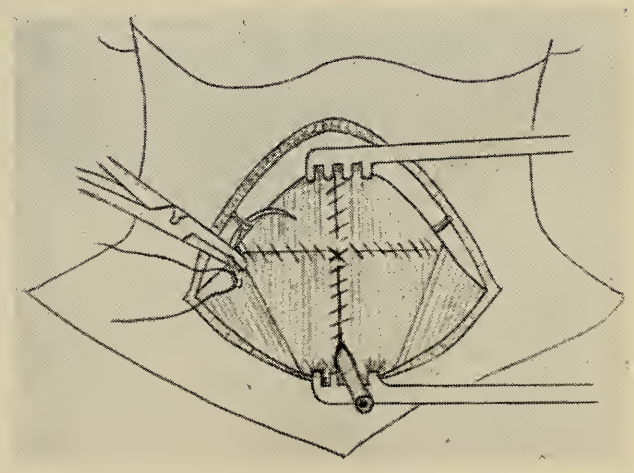

Fig. 3. Sternohyoid and sternothyroid muscles are sutured and drainage-tube is inserted at the lower part of the wound. The veins in the flap are underrun and tied. Suture of platysma and skin completes the operation.

the first attack an unusually severe one it would be justifiable to consider operation after it had subsided.

Undoubtedly, there are patients who do not show this typical rise and fall of symptoms, but run a more or less continuous course, and these should be operated on. One must bear in mind that continued thryoidal intoxication tends towards organic changes in the heart and other organs; and, if this be allowed to progress indefinitely, the damage done will be permanent. Surgery will arrest further damage to these organs by reducing the output of toxins, but cannot repair damage that has already been done. Landstroem[19] has drawn attention to this fact.

Contra-indications to immediate operation.—Operation should certainly not be undertaken in those acute fulminating cases which Osler describes and in which Schlesinger[20] has pointed out the high mortality following operation.

Operation should certainly not be undertaken during the recent onset of acute intoxication in any stage of the disease.

In cases of organic disease of the heart the patient should first be under the care of an internist expert in the diagnosis and treatment of cardiac conditions.

Operation.—A factor of great importance in the operation, is the anesthetic. Almost every anesthetic, general and local, has been used, but the one which seems rationally indicated, is a combination of nitrous oxide and oxygen, together with anocaine and adrenalin as local infiltration. It is to Crile that we are indebted for this development in anesthetics, which aims at reducing to a minimum the element of shock

A transverse incision two and one-half to three inches long, and a finger's breadth above the sternum, is made through the skin and platysma. The anterior jugular veins are divided between artery forceps, and

a flap of skin and platysma is dissected upwards. The infrahyoid muscles are next separated along the midline and retracted laterally. If retraction alone does not admit of a sufficient exposure of the gland, the sternohyoid and sternothyroid muscles are divided transversely.

One lateral lobe is now freed, by blunt dissection or with the finger, and lifted into view. The superior thyroid vessels are caught where they enter the gland at the upper pole, and are divided between forceps. The lateral lobe can now be pulled forward, and several clamps applied to the large vessels as they are seen crossing the capsule of the gland in an anteroposterior direction. These clamps are applied just posterior to the line where the section of the lobe is to be made, and necessarily one has in mind when applying them the amount of gland to be left for the purposes of thyroid function. When all vessels in the capsule have been clamped in this manner that part of the lobe in front of the clamps is now removed with the knife, leaving the posterior part of the capsule and a small portion of gland in front of it. (Fig. 1.)

The isthmus may now be divided or left continuous with the detached portion of the lobe, and the opposite lobe dealt with in a similar manner to the first. One or two small branches of the inferior thyroid artery in the substance of the gland may require ligation, but it is remarkable how little bleeding there is from the actual gland substance when all the vessels in the capsules have been carefully caught before section is made. Should oozing continue after all clamped points have been tied, the divided edges of the capsules may be sewn from side to side over the raw surface. It will be seen that no attempt has been made to secure the inferior thyroid artery before it has entered the gland substance. This is not only an

unnecessary procedure but one to be avoided so that the circulation to the remaining portion of gland and parathyroids shall be preserved. Furthermore, this eliminates all possibility of injury to the recurrent laryngeal nerve, which does not come into view in any stage of this operation. The two remaining portions of the gland are allowed to fall back into the recesses on each side of the trachea. (Fig. 2.)

The divided ends of the infrahyoid muscles are approximated, sutured with catgut, and a drainage tube inserted between these muscles down to the gland. The anterior jugular veins are surrounded with catgut stitches and tied on the deep surface of the flap some distance from the edges. (Fig. 3.)

The flaps are next secured by two sutures of silkworm gut. The first is passed through the skin, and runs as a continuous stitch uniting the edges of the divided platysma, then out through the skin again; the second is a Halstead intradermic stitch, uniting the divided edges of the skin. Thus no catgut remains near the suture line, and the sutures of silk-worm gut, which close the incision, are later completely removed. By this method an almost invisible scar is obtained.

The advantages of bilateral resection over unilateral lobectomy or unilateral lobectomy with partial excision of the opposite lobe are as follows:

1. Minimum of injury to the parathyroids.

2. Absolute safety for the recurrent laryngeal nerve.

3. If, for any reason, further removal of gland should be indicated, such as for recrudescence of symptoms of thyreotoxic activity or the rare, but possible, occurrence of malignancy, the one side could now be completely removed with an assurance that some portion of gland remained.

4. It is a physiological fact that where there are paired organs should one be removed the other undergoes hypertrophy. This, while desirable where the remaining one is normal, is what we wish to avoid in the case under discussion, and this end is best obtained by double resection.

5. Finally, for cosmetic purposes in the operation of lobectomy there is a well-marked depression on the side from which the lobe has been removed, and on the other side the portion of gland left produces an undue prominence, while in bilateral resection the neck is obviously symmetrical.

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DISCUSSION OF THE TWO PRECEDING PAPERS

Dr. E. S. Judd (Rochester, Minn.): Dr. Hertzler spoke of the adolescent thyroid and the difficulty in differentiating it from a true hyperthyroidism. I should like to ask if he has studied the metabolism in these cases? We have found this of great help in the matter of differentiation, and we believe that the metabolic rate is very greatly increased in the presence of hyperthyroidism. It has been an important aid in diagnosis.

With reference to ligation in toxic goiters: We have preferred to put all toxic goiters in one group, which includes hyperthyroidism and thyrotoxicosis. There has been a tendency to separate these goiters into two distinct groups: one containing the exophthalmic goiters in which the gland is considered very active and the symptoms presumably are produced by the overactivity of the gland; the other group includes the thyrotoxic goiters,—those associated with degeneration in the thyroid and in the adenomas, and the symptoms presumably produced by the absorption of degenerative products.

Ligation of the vessels reduces the blood supply, and is supposed to diminish the functional activity of the gland. Therefore, ligation of the vessels of a thyrotoxic gland when the symptoms are being produced by the absorption of degenerative products, would increase the difficulty because the reduced circulation tends to increase the degeneration.

Dr. Hertzler and Dr. MacLean have emphasized the point that thyroidectomy should never be considered a life-saving procedure. In 1909 I reviewed about 120 cases in which operation had been done for more than five years, and in these there were seven deaths directly following operation, and five of the seven followed ligation. All of these operations were done as a life-saving measure. We have found in the last few years that such operation is not a life-saving proposition, and that we can stop the process by putting the patients to bed, but not by operating; we are all agreed as to that.

In Dr. Hertzler's patients without much evidence of exophthalmic goiter, which were more or less chronic cases before being discovered, we would consider a study of the metabolic condition advisable.

We have not seen any cases of the post-operative myxedema, such as Dr. MacLean speaks of. Now that we know something more about the metabolic rate, we are beginning to see things we did not see before.

Dr. W. D. Haines (Cincinnati, O.): There is one feature of this paper that is particularly interesting. It pertains to the management of hyperthyroidism when complicated by other surgical lesions.

I had an opportunity some twelve years ago to study the development of the early manifestations of hyperthyroidism in a patient who was suffering from an acute appendicitis when first seen by me. The patient had been ill, presenting gastro-intestinal symptoms for forty-eight hours. The temperature was 100° F., but the pulse-rate was very rapid, 130 beats or more per minute; the abdomen was moderately distended, and there was marked rigidity of the abdominal muscles. The wide difference between the pulse-rate and the temperature, together with the slight pain of which the patient complained, caused me to give an opinion that we had to deal with a perforated appendix and to advise immediate operation. At operation an acutely inflamed, but unperforated, appendix was removed.

It was only after a very stormy post-operative recovery, marked by rapid pulse and nervousness, that the underlying cause of the mistake in the diagnosis was discovered.

The gastro-intestinal symptoms subsided in a day or two, but the patient became very restless and difficult to manage. The pulse-rate at the time was 170 per minute.

During her stay in the hospital the patient developed a mild exophthalmos. She also showed the fine tremor of fingers and tongue, and had a marked tachycardia before leaving the hospital.

After receiving a rather prolonged course of treatment without any decided benefit the patient returned for operation upon the gland. The right lobe and isthmus of the thyroid were removed, and the superior thyroid artery on the left side was ligated at this operation.

Marked improvement followed, but did not continue. When she returned to work the symptoms began to return, and when she was admitted to the hospital about five months after the operation on the gland, the exophthalmos was much more extensive than at the time of her operation. Almost the entire remaining left lobe was removed, and after a protracted stay in the hospital the patient recovered with a badly damaged heart and a mild exophthalmos. She has been working and earning a living and has remained free from thyroid symptoms since the last operation.

Unless we constantly keep the various manifestations of hyperthyroidism in mind we are prone to overlook the condi-

tion when it occurs as a concomitant of some other disease.

We almost never think of operating on a growing girl for hyperthyroidism. In addition to the sex-stimulation of the gland at this period there is the high school course in which she carries her books home and burns the midnight oil. Some misfortune, death of a parent or financial reverses, may necessitate leaving off the high school course and taking a high-pressure wage-earning position. Now, the added burden of responsibility not infrequently is quickly followed by symptoms of acute hyperthyroidism. In a medical way—and I think they are all medical cases in the beginning—the best results follow where the surgeon and internist are associated in the treatment. These patients in my experience have nearly all recovered, following proper care without operation.

The subject, as has been dwelt upon in both papers, shows an unsatisfactory state in the medical mind, and it will probably continue to remain so until we learn more about the causation of hyperthyroidism. We no longer think of one cause alone. There are many causes that will cause the gland to become more active and the symptoms will continue until relieved by medicine or surgery.

Our pathologist finds many changes in the specimens submitted to him. Of especial interest is the constantly increasing numbers of malignant and tuberculous thyroids he reports as experience broadens.

Dr. H. B. Sweetser (Minneapolis, Minn.): There are two or three points I would like to emphasize.

First—In the very acute cases of hyperthyroidism what plan of treatment is most likely to succeed? In our experience even ligation of the vessels has failed, and we have come to depend on absolute rest in a darkened room, an absence of noise and fuss, and no one allowed in contact with the patient except the attendant nurse. Under this plan many of these patients improve to a point where they may be safely operated on.

Second—As regards anesthesia: We prefer general with ether. We can work more expeditiously, and there is less strain both on the patient and the operator. This may be because we have not developed the best technic for local anesthesia.

Third—Concerning technic: We no longer restrict ourselves to removal of one lobe and the isthmus. The cosmetic results were poor, and patients would return with recurrent symptoms and hypertrophy of the opposite lobe. We now remove the isthmus and parts of both lobes, and tie both

superior poles. In this way there is no danger of interfering with the recurrent laryngeal nerve, the cosmetic result is better, and the probability of relapse very much diminished.

Dr. Hertzler (closing on his part): The gain in weight strikes me as a good index of the value of any treatment. Some of these patients take on weight if they are simply put to bed and not treated at all, but if this happened when you were doing anything for them you would be convinced that the therapeutic measure was of value.

Dr. MacLean (closing on his part): I was glad to hear Dr. Judd mention the difference between ligation in the true exophthalmic and those of the thyroxtic type. There seems to be a distinct difference in these two types of cases, and we are just beginning to find out about it. I think we owe a great deal to the work done at Rochester along that line.

Speaking of metabolism: The one patient who died following injections of boiling water was a very severe case, and one of the marked symptoms was the great amount of food she could consume. If her metabolic index could have been taken it would doubtless have been very high. We have not as yet been able to carry out this line of work.

As regards experiments: These can be used only as a guide to a certain extent. They do not always apply clinically. We have done some experimental work that is not yet sufficiently complete to be reported, but we have found that dogs can live if one parathyroid is saved. It is difficult to do that in the dog, but we have run across a few cases where one parathyroid was distinct from the thyroid and have removed all the thyroid and all the parathyroids except this one, and the dog has lived and apparently had no symptoms from the operation. No definite report can be given on this work yet.

As regards tubercular infection in the thyroid: We have not observed any cases with definite tuberculosis, probably on account of our cases being more limited in number. I am consultant at a tuberculosis sanitarium, and have seen only two cases of exophthalmic goiter at this institution. I think one of the patients was there on account of the obscurity of the symptoms rather than that a definite diagnosis had been made, although the other patient had positive tuberculosis of the lungs and symptoms of hyperthyroidism associated with it. Whether there was tuberculosis of the gland was not known, because no operation had been done.

With the permission of the chairman I would like to show a few slides that I brought with me.

PURGING BEFORE AND AFTER ABDOMINAL SECTION

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A few years ago the drift of surgery, as a result of the introduction of anesthesia and the adoption of antisepsis, was toward the development of technic and the perfection of methods. Coincidentally, much attention was given to the elaboration of the preparatory and after-treatment. Many things were recommended and more or less extensively employed for the purpose of fortifying the patient for the operative ordeal, and of neutralizing the untoward effects. As surgical technic improved and methods were perfected these measures were found, one after another, to be no longer necessary, and were eliminated; and the preparatory and after-treatment assumed a simplified, more or less routine character.

One of the routine measures which have survived is pre-operative and postoperative purgation; yet there are those who are now seeking to give this attempted imitation of a simple process of nature its coup-de-grace. They not only declare it unnecessary, but attempt to prove by arguments and experimentation that it is harmful in its effects. I shall try to avoid prolixity and irrelevance by restricting my remarks to purgation in cases of intra-abdominal surgery in which the opening of the peritoneal cavity makes the condition of the intestinal canal a matter of considerable importance.

Let us take up first the subject of preparatory purging. But before we can discuss it intelligently we must define what we wish to do by it, and how we do it. I suppose that the main purpose is to cleanse the bowels of any gas or feces that might interfere with the attainment of the best results from our operative work. Another purpose is to have a comparatively empty colon in cases in which it may be desirable to keep our patient constipated for two or three days after the operation. The main argument against such purgation is that it seldom cleanses the bowels, and more often increases than diminishes the abdominal distention; and such really seems to be the case in many instances. An examination of the way in which it is ordinarily carried out in practice will show why. When a plumber cleans out a sewer he does not put dirt into it at the same time, because he knows better. But when the average surgeon prescribes a laxative to clear out the bowels, he allows food to be taken a short time before the laxative is given, and allows, or orders, more to be taken before the laxative has quit working. The result is that, instead of cleansing the bowels, the laxative merely moves everything onward. It expels old fecal matter and gas along with the digestive secretions and ferments while the stomach is delivering food into the duodenum. This food not only does not find the normal secretions for its digestion, but it is rushed onward too fast for digestion, and arrives in the colon as food for bacteria rather than for the patient. Not only this, but more food is usually given before the intestines have recovered from their fatigue sufficiently to take care of it. As a consequence they become distended, whether they have been so previously or not. If such is the ordinary preparatory purging—and I think it is—then it does not require much argument and experimentation to condemn it.

This might be said to conclude the argument from the objector's standpoint, but it does not touch upon the merits of the question. The question is whether a laxative can be given so as to accomplish what we give it for, and, if so, how? I think it can, if what I shall call the four R's are observed, namely, the right laxative, in the right dose, at the right time, and under the right conditions. To begin with the last R mentioned, the surgeon or somebody should prescribe the *conditions* under which the desired results of the laxative may be secured. The material for the renewed formation of gas should be kept out of the alimentary canal; the last food that the patient takes before taking the laxative should have time to leave the duodenum, and be absorbed before the rapid peristalsis connected with purgation begins. After the purgation has ceased, none but easily digested food in properly regulated quantities should be given, such for instance as the quickly absorbable forms of sugar, meat extracts, or nutritive wines, or, if the patient is very weak, predigested food, until the upper intestines have sufficiently recovered from their fatigue to assume normal function, which may be before, or not until after, the operation, according to the requirements of the case.

But the fact that such severe restriction of the diet is required constitutes an indication for limiting our attempt at securing collapsed or partially collapsed intestines to the cases in which they are not already sufficiently collapsed, and in which the conditions of the operation require it.

The timing of the laxative must be such that any residual gas which may be left will have a chance to be absorbed. Thus, for a forenoon operation the laxative will have to be given early on the day before or, in some cases, the night before that. For an afternoon operation it will ordinarily be required the night

before the operation, and sometimes earlier. If the object in view be the getting of the patient in a good condition for the operation it may have to be given three or four days before, and the alimentary canal, for two or three days, be allowed to functionate normally and under low pressure—if I may be allowed the term.

On account of the variations in the character of the different operations and the differences in condition of patients, the kind and amount of purgation should be adapted to the requirements of the concrete case. One abdominal section may require a low incision, another a high one; one a large incision, another a short one; one case may require work at the bottom of the pelvis, another at the surface; one intestinal work, another none; one operation may be a long one, another a short one; one may require general anesthesia, another local only,—that is, one case may require no attention to the bowels even though they be somewhat distended, while in another a carefully conducted preliminary purgation may be essential to reduce the distention and enable the operator to do good work.

Again, a patient may come to us half starved and with collapsed intestines, and may not even need an enema, or perhaps only a mild stimulating one to relieve the sigmoid flexure, or an oxgall enema to soften and remove a few hard fecal masses from a dry and sluggish rectum. In such a case only harm could come from ordinary routine purgation and dieting. On the other hand a patient may be a strong, hearty eater, with a full abdomen and powerful abdominal muscles, who requires active purgation to remove foul gases and diminish intra-abdominal pressure, and who can stand any amount of dieting. One patient may be habitually constipated, and on that account require a powerful laxative; another may

always have daily movements, and require only an enema; one may have accumulations of fat both inside and outside of the abdominal cavity, while another may be emaciated; one may have idiosyncrasies with regard to laxatives or enemas or anesthetics, another may feel as well after purgation or anesthesia as if he had not taken them; another may have an organic disease that diminishes his resistance or otherwise makes him a bad risk.

Now, who would advocate sending a patient for such a variety of abdominal operations, and exhibiting such dissimilar conditions, to a hospital to be prepared in a routine way with routine purgation, and perhaps without seeing him again until he finds him on the operating-table? And yet such is the course pursued in some of our clinics in large crowded hospitals, where routine is essential to keep things going and where individualization may be possible in private cases only.

The laxative should be selected, the dose regulated, the time for its administration chosen, and the conditions under which it acts carefully adjusted to suit the requirements of the concrete case, instead of being used in a routine way. Then there will be no occasion for the rejection of purgation in the preparation of patients for abdominal sections.

It should be remembered also that the colon bacillus is not very virulent, and kills people only under exceptionally favorable circumstances, and that patients in normal condition and without abdominal distention do not require a stirring up with laxatives before an abdominal operation. A restriction of the diet will sometimes promote abdominal flaccidity better without a laxative than with it.

With regard to the question of purgation after abdominal section: We may divide the cases into four classes,—namely, those in which the character of

the operation requires early purgation, those in which it requires delay in the administration of purgatives, those in which the indications are relative, and those in which the question of purgation is not dependent upon the fact that the abdominal cavity has been opened.

First—Early purgation is required with a large incision in the middle or lower zone of the abdomen in connection with considerable displacement of intestinal coils, and sufficient intraperitoneal traumatism to cause subsequent adhesions to form. Under such conditions adhesions of displaced or kinked intestinal loops are liable to form, and interfere with through and through peristaltic action and result in obstruction and death. Early purgation helps to maintain a permeable canal until the adhesions have formed and the danger of obstruction has passed.

Second—Cases in which there has been resection or extensive repair of the intestines usually require dieting and delay in purgation until a certain amount of protective exudate has had time to seal up the intestinal suture lines.

Third—Cases in which sutured or denuded areas have been left are not so liable to the formation of extensive or permanent adhesions if peristaltic action is kept fairly active from the time of the operation. Early purgation may not be necessary, yet may be desirable. An accumulation of gas may require it in one case, while in another dieting or washing out of the stomach or postural treatment may suffice.

Fourth—Cases in which the incision has been small with but little exposure or manipulation of the intestines, and in which all ligatures or denuded surfaces have been covered, will require purgation or abstention from purgation for conditions that may happen

to present themselves, without reference to the fact that the abdomen has been opened. When such patients have not been dieted either before or after the operation they may have early spontaneous bowel-movements without laxatives or may merely require enemas to assist nature, while others who are accustomed to depend upon laxatives may require early purgation for relief. Patients who have been dieted before the operation and in whom the anesthetic has disturbed the stomach will have but little substance in the alimentary canal and may do better without a bowel movement for two or three days.

It has not been my intention in this communication to go into an exhaustive discussion of the subject of purgation before and after operation, but merely to call attention to the harm that may be done by employing it in a routine way, and to the desirability of individualizing the indications. A routine method may be a good thing for a surgeon or a hospital staff to have on record, not as a method to be followed but as one to be modified. It may happen to be just right for some cases and in others it may require modification in a few particulars only, and may thus be of time saving assistance to the one who formulates the directions for each case as well as to the one who has to interpret them and carry them out.

DISCUSSION

Dr. Howard Hill (Kansas City, Mo.): I think a cathartic is not necessary immediately before operation. Many people are found who are chronically constipated, and they should receive the proper treatment, but not just before operation. If you want to lose a horse-race just give the horse a cathartic the night before the race. Generally speaking, I feel that a person whose bowels have been moving normally up to the time of operation does not need a cathartic at that time. I have not given them to patients for the last two or three years, and I think they got along better than they did before.

Dr. C. H. Wallace (St. Joseph, Mo.) I have not been giving cathartics before operations for several years. I quit because my own experience seemed to teach me that it was harmful. If a well man takes a dose of castor oil at bed time he is disturbed in the night and the next moring is comparatively knocked out, and it takes until afternoon to get right again. That has helped to convince me that this practice was harmful rather than useful in cases for operation. We all learned from Dr. Ochsner years ago that purging in acute abdominal condition before operation is hazardous. I have made this rule: To a patient who comes to me who is in the habit of taking a pill every night and has done this for years, who is chronically constipated, I give the usual purgative whatever that may be. If a patient comes with a history of regular bowel-movements every day, never constipated, he gets no purgative, but an enema the next morning before the operation; and I have felt and believed that these patients suffer much less from post-operative vomiting and gas pains than when purgatives are given beforehand. I think each individual case should be treated according to the history, and we should judge by that whether a patient is to be given even a mild laxative. but not a purgative.

Dr. A. J. Ochsner (Chicago, Ill.): I think that Dr. Byford has given us the correct philosophy of the thing. I have made a practical study of the use of purgatives before operations for the last thirty-two years. I have tried all of them, from calomel to castor oil, and have come to the conclusion that the principle laid down by Dr. Byford is the correct one. If you give cathartics you must not give food that will fill up the intestine again before the operation.

Then, again, I believe with him that you must be careful in selecting the kind of cathartic. Be careful to select nothing but castor oil in two-ounce doses given in beer foam, ginger ale, or some other good vehicle. If you do that you will be through with the annoyance within three or four hours, because it sweeps through and leaves the intestines free of all annoying things. I have tried it myself, taking half an ounce and having an endless amount of bother; taking one ounce with less bother; taking two ounces and no bother and feeling like a fighting cock the next morning. If the oil is taken by 4 p. m. the patient is through with it by bedtime. Then give the patient nothing but broth; after that before the operation, give an enema for local cleansing.

Then the intestines are empty, and no fermentation takes place afterward. If there should be a little mucus which the patient swallows and it causes gas, insert the stomach-tube and wash it out with hot water, and that will do away with gaseous distension, and there will be no intestinal obstruction after the operation. When we were using calomel or salts we had more or less trouble of that kind. After the operation, if the patient needs any support, he gets the Murphy drip.

What was said about the race-horse is perfectly correct, only they never give the race-horse castor oil. If they did he would win out every time if it was given before 4 P. M. the day before the race.

Dr. James F. Percy (Base Hospital, Camp Kearny, Calif.): There is one thing not mentioned in this paper, and that is the pernicious practice of giving an enema to these patients about four o'clock in the morning. It is not only unnecessary in the average abdominal case, but it robs the patient of several hours of sleep which is too valuable to be wasted in this way.

Dr. Byford (closing): I want merely to call attention to the fact that I spoke of routine cathartics. I do not believe extreme views are the right ones on any subject. The man who never gives a cathartic and the man who always does are equally wrong. If you want to open the abdomen of a patient with toxemia and distended intestines, I think it is the proper thing to give a large cathartic. I do not know whether any of you have ever taken a large cathartic for such a condition, but if you have you have probably been surprised by the amount of relief afforded in so short a time. But no one ought to make a routine practice of giving or not giving it. The point is, that every case should be individualized, and the question of purgation or no purgation, and the amount of purgation, should depend upon the condition of the alimentary canal and the requirements of the operation.

A FIBROSARCOMA OF THE SKULL

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The origin, the etiology, and the classification of tumors, long have been, and are now, subjects of careful investigation and thoughtful discussion.

Many theories as to their etiology have been advanced, but as yet none has been proved.

Much talked of and familiar to all are the following:

Parasitic stimuli.

Long-continued irritation by bacteria or protozoa.

Injury.

Regression of tissues.

Disturbance of tissue-balance.

Displacement of embryonic cells.

Changes in cells by anaplasia.

Acquired tumors by metaplasia.

Each one of these has had enthusiastic supporters, but the problem remains unsolved.

Quoting F. B. Mallory: "We know a great deal about the gross and microscopic appearance of tumors and in regard to their classification, but nothing in regard to their cause, and little in regard to their origin."

The tumor under consideration is a very interesting one, and has been diagnosed as fibrosarcoma, endothelioma, and psammoma.

The patient, Mr. C. E., aged 46, Swedish, farmer.

Family history, entirely negative.

Past history; negative except for an injury to the skull twenty-three years ago, the patient being struck by an iron

bar, near the bregma. No medical attention was had.

Four years ago, noticed a small, hard, bone-like tumor at this area, which grew very slowly to a diameter of 2.5 cm. Four months ago the tumor began to grow rather rapidly, until now it measures 10x10x3 cm., and is hard and firmly attached to the cranium.

One month ago a surgeon attempted to remove the tumor, but desisted, owing to difficulties encountered. At that time the patient suffered an intense headache, lasting two days.

There has been no loss of weight or strength, and the general health has been good. The patient has had no pain except the headache referred to above.

Mindful that metastases are found in the skull, a careful search for a possible primary tumor was made, but without result. The *x*-ray plates show the tumor external to the skull.

The diagnosis is fibrosarcoma or endothelioma.

This patient had been advised against operation, and an *x*-ray therapy suggested. After careful consideration of all data obtained, operation seemed best, and was advised. The tumor was, in consequence, removed, under novocain anesthesia very skillfully administered by Dr. R. E. Farr, who also assisted at the operation.

The tumor was largely limited below by the bones of the skull, but it had eroded through at two areas, and passed downward between the cerebral hemispheres. It was found necessary to resect an area of the dura, including a portion of the longitudinal sinus, 7.5 cm. in length, in order to remove the entire tumor mass.

The patient made an excellent recovery, and was able to leave the hospital in six weeks, walking with the assistance of a cane, having recovered from the paralysis which followed the operation.

During the five months since that time he has worked hard on the farm, and suffers no discomfort at all, except an occasional pain in his lower extremities.

There is no evidence of recurrence.

From the history, the tumor appears to have originated from the injured pericranium, and to have infiltrated the bone.

From the history and the examination of the gross specimen, in its relation to the dura, endothelioma seems less likely than fibrosarcoma.

It has been said that every unusual tumor which lacks characteristics which will permit its ready recognition, stands an excellent chance of being labeled endothelioma, and relegated to oblivion.

It is very difficult to prove that any tumor originates from endothelium. The cerebrospinal spaces are lined with endothelium, and tumors here are not infrequent, but they usually press inward and displace the brain tissue.

This tumor seems to have originated from the pericranium, and to have grown outward, and only at a late period to have passed through bone and involved the tissues of the longitudinal sinus by expansion.

From the microscopic examination, the tumor is a fibrosarcoma with some epithelial pearls and much hyaline degeneration present.

THE EMPYEMA PROBLEM

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There has never been a greater opportunity to study empyema than at the present time. The country is passing through a second epidemic of pneumonia, the consequence of which is the accumulation of a very large number of cases of empyema and lung abscess. The first epidemic in the fall of 1917, lasting through the winter, was largely confined to the military camps, and was mainly due to the streptococcus hemolyticus, often associated with the pneumococcus. The second and more virulent epidemic, which began in the summer of 1918, swept the country from the Atlantic to the Pacific, and did not spend its ravages on the camps alone but attacked as well the civil population. This epidemic appears to be of a different type from that of the previous year, being preceded in a large percentage of cases by what is now commonly called Spanish influenza.

Previous to these epidemics, empyema was not a common complication of pneumonia; lung abscess was more frequent. We were not accustomed to watch for empyema in each case which recovered from pneumonia. It was somewhat surprising, therefore, that during the epidemic in September, October, and November, 1917, at the different camps, there appeared among the soldiers a very large number of cases of empyema after bronchopneumonia. It was evident that we had to deal with an unfamiliar type of infection. Not only were the complications more common, but the

mortality also was very high, ranging in various localities from 20 to 60 per cent. At camp Pike they had from September, 1917, to September, 1918, 1,285 cases of pneumonia, with a total average mortality of 26 per cent. Empyema complicated 9 per cent of these cases of pneumonia. Similar reports came from other cantonments. It was evident that this was an infection of a more virulent variety than we had treated in previous years. The anatomical conditions of these cases of empyema were likewise different. In the ordinary case of former times, as a rule, the pleural sac was found filled with pus. In the type which occurred in 1917, many cases had multiple, locked-off compartments filled with pus; sometimes abscesses were found in the spleen, liver, and abdominal cavity. It resembled more a pyemia, with constant pleural involvement. In the present epidemic of influenza, pneumonia in a most violent form, with high and rapid mortality, asserted itself again, and thus we anticipated that empyema might also arise a little later in the recovered cases, and this proved to be the fact. I am informed that at the Great Lakes Base Hospital 250 cases of empyema following the last epidemic have already developed from recovered cases of pneumonia.

We must expect the same complications to follow the cases among the civil population, and, in fact, they have already begun to appear.

In a report published in the *Journal of the American Medical Association,* November 16, from Camp Sherman (Ohio), of 2,001 cases of pneumonia resulting from 7,618 cases admitted for so-called influenza, 842 died, leaving 1,159 which recovered. The writer of the article stated that at the time of publication only one case of empyema had developed in these 1,159 recovered cases. Suspecting that more cases might have developed since the report, I inquired and received reply from Major A. Friedlander, in which he

states that since writing the article there had developed about 150 cases of empyema from the 1,159 which had recovered from the pneumonia.

This indicates that the empyema may develop very slowly and may not be diagnosed until several weeks after the patient had apparently recovered.

We shall learn many new facts from the present epidemic. The reports from the different camps, in which they have had the great advantage of treating many cases of the same type by one method, are gradually finding their way into the medical literature and from them we can learn the most. It is somewhat early, however, to make comparative studies, since the reports from many camps are still missing. At the present time we must be satisfied with such analysis of the subject as our present knowledge offers, and in attempting this I shall try to answer the following questions:

1. How shall we explain this unusual virulence and high mortality of the pneumonia and empyema?
2. How shall we recognize an empyema as early as possible?
3. How shall we differentiate an empyema from a lung abscess?
4. What means other than operative may be employed to cure empyema?
5. How shall we proceed with an operation after we have made a diagnosis?
6. What operation is the most desirable, resection of a rib or drainage between the ribs? Local or general anesthesia?
7. What method of drainage shall be introduced?
8. What shall be done to produce disinfection and closure of the pleural cavity in the shortest possible time?
9. What are the causes of non-closure of drained empyema?

10. What shall be done with chronic suppurative cases with sinus or lung abscess or empyema, which have persisted in spite of treatment?

VIRULENCE AND HIGH MORTALITY

Thus far no one has ventured to make a positive statement to explain the cause of the high mortality and the frequency of complications. The causative factor is not definitely known. It has been suggested that the organism causing the epidemic is an ultramicroscopic one not yet demonstrated, or the influenza bacillus which prepared the body for the pneumococcus and streptococcus invasion. The susceptibility or rather lack of immunity against this new type of infection is another theory advanced. One fact seems to stand out very plainly, namely, that robust adults are more susceptible than the very young children or people above fifty. This is just the reverse of the usual. It is also apparent that persons afflicted with asthma, chronic bronchitis, or pulmonary tuberculosis are more often spared than the perfectly healthy.[1]

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[1] A very convincing illustration of this fact appears in the Monthly Bulletin of the Municipal Tuberculosis Sanatorium of Chicago in December, 1918.

Of 1,551 cases with pulmonary tuberculosis from six institutions, only 85, or 5.4 per cent, were afflicted with influenza, only 8 cases had pneumonia as a complication, and only 1 case terminated fatally. In four of the institutions, as shown in the detailed report, there was not a single case:

	Patients	Incidence of Influenza
Municipal Tuberculosis Sanatorium	587	35
Oak Forest Infirmary	560	50
Cook County Hospital	154	0
Chicago-Winfield Hospital	55	0
Chicago Fresh-Air Hospital	100	0
Edwards Sanitarium	95	0

It is also remarkable that the cases of glandular tuberculosis were more predisposed than the pulmonary cases. Of 154, 46.2 per cent had contracted influenza, thus bringing the pulmonary type down still lower.

Comment upon this report: Is it not likely that the secondary infection in tuberculosis which is usually a streptococcus is the immunizing factor in these tuberculous individuals? Why should influenza spare the pulmonary tuberculous individual and not the glandular tuberculous? Answer: The glandular is not complicated by a secondary streptococcus.

Alcoholism, which is considered a predisposing factor to pneumonia, cannot be claimed to be so in this epidemic. Young soldiers, rarely alcoholics, and young women are the most susceptible victims. The almost universal fatality in pregnant women also indicates that we are dealing with a new type of disease.

The mortality-rate depends largely upon the violence of the initial attack. Those who are unfortunate in receiving a severe initial blow rarely recover; cases have been reported which terminated fatally within twelve hours, from apparently perfect health to a corpse within half a day. These patients seem to die from lack of oxygen rather than from the toxic effect of the poison. The lungs are congested to such a degree that the air cannot enter the vesicles and the patient dies practically from suffocation, or rather from drowning. The heart and kidneys are not sufficiently affected to cause death. Whenever a patient has stood the first shock and bridges over the first week of illness, he has a fair chance for recovery; an index of which is found in the rise in the number of the polymorphous leucocytes in the blood, which at the outset is very low, often as low as 4,000 and gradually rises to 10,000 or 12,000.

That the patient does not die from influenza seems certain. Only 8 per cent of the fatal cases at Camp Custer produced cultures of the Pfeiffer bacillus from the secretion of the cut lung and only 3 per cent from the blood, while 78 cases produced 1 or the other types of the pneumococcus and 142 cases the streptococcus. It is, therefore, evident that further investigation will be necessary to determine the real cause. Our present knowledge is too meager to establish it.

EARLY RECOGNITION OF EMPYEMA AND DIFFERENTIATION FROM LUNG ABSCESS

It is unncessary to discuss here the usual physical signs and the part the history bears upon the differen-

tial diagnosis. We shall consider only the methods which are corroborative, namely, the stereoroentgenogram and the probatory puncture.

As soon as percussion and auscultation have convinced us that a certain portion of the chest is not normal, it is our duty to take a stereoröntgnogram of the entire chest. The following conditions must be considered: (1) unresolved lobar pneumonia; (2) acute active bronchopneumonia; (3) fluid in the pleura, serous or purulent; (4) lung abscess; (5) pneumothorax; (6) acute pulmonary tuberculosis.

The correct interpretation of the stereoröntgenogram in the differentiation of the conditions just mentioned is of paramount importance and for this reason I shall present here a röntgenogram of each type, to demonstrate differential points.

Unresolved pneumonia.—A dense shadow corresponding to any of the five lobes, with the rest of the lung comparatively normal, indicates an unresolved pneumonia. Figure 1 illustrates a typical case. We note that the left upper lobe on one side is quite distinctly outlined in contrast to the rest of the lung tissue. An abscess rarely produces a shadow which would correspond to the shape of a single lobe. It would produce transparent areas representing lung tissue around the abscess and possibly show a dense shadow of the abscess wall which the unresolved pneumonia does not produce.

2. *Bronchopneumonia.*—This gives an entirely different picture. At times both lungs are involved and the picture resembles more that of an advanced tuberculosis of the lung. The entire lung, or parts of it, is studded with shadows varying in size from that of a hazelnut to that of an egg; these shadows sometimes merge into one another and leave transparent areas between them. (Fig 2).

3. *Fluid in the pleural cavity.*—When the pleural cavity is entirely filled with fluid, the lung is compressed toward the hilus. If no adhesions are present it retracts upward and posteriorly. The röntgenogram of this condition will present a shadow resembling ground glass, nearly equal in density throughout the entire area occupied by the fluid. This, however, is true only when the patient is on his back while the röntgenogram is being taken, because the fluid gravitates and covers the entire posterior area of the pleural cavity. (Fig. 3.) In cases in which the quantity of fluid is not large and the röntgenogram is taken in the standing or sitting posture, we will obtain a characteristic picture: the fluid will gravitate into the lowest part of the pleura and produce a dense shadow up to its upper margin—above that there will be a distinct pneumothorax. (Fig. 4.) Another röntgenogram taken in the lateral position, namely, with the patient lying on the affected side, will produce a shadow corresponding to the level of the fluid along the outer part of the chest, and a pneumothorax between the margin of the retracted lung and the level of the gravitating fluid. This is clearly illustrated in Figure 5. If the same patient is turned on the unaffected side the fluid will gravitate toward the middle line and leave a pneumothorax externally. (Fig. 6.)

The röntgenogram will give us scant information as to the character of the fluid, except that the purulent fluid is likely to give a denser shadow than the serous. It requires probatory puncture to settle this question.

4. *Lung abscess.*—The diagnosis of a lung abscess is more difficult. A patient may have had an encapsulated pocket of pus in his lung for months and even years before a diagnosis is made. Its location by physical examination is more difficult because it is usually centrally located and, as a rule, much smaller than an empyema. (Fig. 7.) The tuberculous abscess

has a distinct wall and is more often multiple and therefore much more easily diagnosed than that resulting from a pneumonia or other causes. (Fig. 8.) When a patient gives a history of having suddenly spit up a quantity of pus and continues to expectorate purulent material, the presence of a lung abscess must be considered. After an abscess has ruptured into a bronchus, its localization becomes more difficult still, because the sac has collapsed, and a probatory puncture will in most instances fail to strike the pus cavity.

5. *Pneumothorax.* There should be no difficulty in diagnosing a pneumothorax, as the physical signs are very characteristic, especially the hyper-resonance. The röntgenogram, however, is most convincing. We find here the absence of shadows in a well defined area which means that the lung has retracted and the space is not occupied by fluid but by air which, of course, produces no shadow whatever. Figure 9 illustrates a typical pneumothorax.

6. *Advanced pulmonary tuberculosis* with abscess will in the röntgenogram resemble very much a bronchopneumonia, showing areas of infiltration of different sizes, and thus the history and clinical findings must assist us in our diagnosis. The healed out tuberculous process, however, gives a characteristic picture, namely, an apparently transparent lung with fine linear markings, corresponding to the bronchi, with many small, distinctly outlined shadows of calcified deposits and many concrete shadows resembling snowflakes, which represent the fine scars remaining from a healed out tuberculosis. Figure 10 illustrates such a case.

Probatory puncture. The probatory puncture should never precede the röntgenogram, because the latter will assist us in choosing the place for the introduction of the needle. The indiscriminate use of the probatory puncture is a dangerous procedure. One should strike the pus, if it is there, the very first time. I should not

advise more than three punctures. If after the third puncture the pus cannot be found, the case should be studied further by other means.

The danger of introducing the needle consists in puncturing healthy lung and carrying the infective material into it and causing secondary abscesses. One might push the needle beyond the confines of a small abscess and thus get no result. In withdrawing the needle one should use some suction at three or four different depths. The pus at times is so thick that it will not flow through a very small calibered needle, thus a suction syringe should always be attached to the needle.

The character of the pus is of great diagnostic value. A smear preparation as well as culture should be made from the same at once and if the fluid is of serous character it should be placed in a test-tube, to see how much sedimentation will occur within 24 hours.

NON-OPERATIVE TREATMENT

The introduction of antiseptics into the fluid within the pleural cavity has been advocated for a number of years. Treatment with 2 per cent formalin and glycerine was introduced by Murphy and has been used extensively by Kreuscher, his former assistant. It is supposed to sterilize the fluid within the cavity, and the fluid is gradually absorbed, thus making its withdrawal unnecessary. It seems to produce earlier closure following drainage; one or two cases were cured without opening, and it has made unnecessary extensive thoracic surgery. It cannot be used in children or in cases with tuberculous etiology but gives its best results in empyema following pneumonia or ordinary pleurisy, after the pleuritic effusion has become purulent.[1]

The chief objection to the formalin is that it produces a great deal of pain. The method is not extensively employed; the reason for this is not quite apparent.

Repeated puncture and withdrawal of small quantities of the fluid at regular intervals has been found effective by a number of surgeons at the military camps. The gradual withdrawal of the fluid by means of a syringe has the advantage of being comparatively harmless but it carries an uncertainty of a final cure. We cannot hope to withdraw every drop of the pus from the pleural sac and since we are bound to leave a certain quantity, the question must arise in our mind, what becomes of the residue? Will it be absorbed? If nature is able to absorb a residue of pus, why cannot she absorb the entire quantity? The advocates of the repeated puncture method must clear up this point by citing a sufficient number of cases with control of röntgenogram comparative studies.

Vaccine therapy is too large a subject for this paper, but it must be taken into consideration. Personally, I have had no experience whatsoever; there are a number of articles, some speaking favorably, others unfavorably, about this method of treatment.

WHEN TO OPERATE

During the present epidemic, we have noted that in the very acute cases of pneumonia a serous fluid, very septic in character, is frequently thrown out into the pleura and compresses the affected lung. This clear fluid will gradually assume a purulent character. If we withdraw about 10 c. c. of this fluid every twenty-four hours and pour it into a test tube we will note that the sediment of these samples will vary. The amount of the grayish purulent material settling at the bottom of the tube will be greater each day, so that the fluid drawn on the tenth day might contain as much as 30 to 40 per cent of sediment and 60 to 70 per cent of clear serous fluid. It is, therefore, very difficult to say at what particular stage of purulization we shall regard the case as one of empyema. Experience has shown

that it is not safe to operate in the acute stages when the fluid is still serous. In the report of the Empyema Commission, in charge of Major Dunham, at Camp Lee, the following statement is made:

> Our observations force us to the conclusion not only that a late operation has decreased the risk of death but also that it has in general been followed by a less troublesome convalescence. Almost without exception the cases in which at the present time there are still large cavities are ones in which operations were performed early. Whether or not the fact that the operation was performed late or in the post-pneumonic stage of the disease, has borne a direct relationship to the more rapid post-operative obliteration of the cavity, cannot be definitely answered. The observation may be only a coincidence, but yet it has been so striking as to suggest that a definite causal relationship has existed.

Whether the deduction of the Empyema Commission, namely, that the mortality is due to the sudden pneumothorax, is correct or not, the fact remains that very early operation is dangerous and should not be undertaken. The theory of the pneumothorax alone does not appeal to me as being the great factor in producing the death rate, because the lung had constantly been in a state of compression by the fluid previous to operation. The lung was immobilized by the fluid and the sudden withdrawal of the fluid releases this immobilization and thereby aggravates the condition because at this time the lung is still in an acute state of inflammation. Another cause which might be responsible for the mortality is the operation itself. The resection of a rib, although not very extensive, opens a sufficiently large wound surface for secondary infection and absorption of micro-organisms, which are contained in the apparently harmless fluid (but very septic, in fact usually the streptococcus). The patient has not as yet acquired sufficient immunity against this particular micro-organism. This is not entirely theoretical. It has been proven in a number of cases that where the blood cultures were free from micro-organisms just

before operation, positive blood cultures could be obtained twenty-four hours later. I cite from the article[1] by the Empyema Commission, Camp Lee, Virginia:

> There is great danger of producing a blood stream infection, evidently because of absorption of streptococci from the surfaces of a fresh wound. That this is a real danger is shown by the fact that in two cases of early operation cultures from the blood were sterile before operation, while cultures from the blood taken twenty-four hours after operation showed numerous hemolytic streptococci.

It is evident that after the fluid has become purulent, it has lost a great deal of its virulence, at least to the same individual in whose chest it has formed. In other words, it has become cold. We know from experience that the longer pus has been retained within a certain location in the body, the less virulent or toxic it is. We may therefore conclude that it is much safer to defer the operation until the fluid has become distinctly purulent, although it is permissible or even advisable to withdraw small quantities with a small cannula to relieve distressing symptoms.

CHOICE OF OPERATION, ANESTHESIA, DRAINAGE

The simplest operation must appeal to us as the most desirable. The method advocated[1] by Major Hugh McKenna, of Chicago, appears to be the simplest. It consists in introducing a catheter size No. 14F. by means of a trocar or cannula, just large enough to thread the catheter into the pleural cavity. As soon as the pus escapes through the catheter the cannula is withdrawn; about 100 cubic centimeters of the pus is then withdrawn by means of an aspiration glass syringe. If the pus is too thick for aspiration, a small amount of neutral solution of chlorinated soda (Dakin's solution) is allowed to run in, which dilutes the pus and renders it easier to withdraw. My reasons for endorsing this method are the following: First, the operation is so simple that the patient takes no

more risk than in the ordinary probatory puncture; second, the wound produced by this operation is so small and the catheter is hugged by the tissues so closely that an infection of the wound is not likely to take place; third, the fluid can be withdrawn gradually —about 100 c. c. every 24 hours, without allowing any air to enter the cavity, thus preventing a pneumothorax. For this reason a clamp should be placed on the catheter during intervals of evacuation. The lung is likely to re-expand gradually as the amount of fluid within the pleura diminishes. However, even this operation should not be performed in the very acute stages, while the fluid is still serous, because at that stage the lung itself is in an acute state of pneumonia and should therefore remain undisturbed. By permitting a lung which is acutely inflamed to expand, we open widely the door for death. Whether the drainage of pus in the cases thus treated will persist or whether pus will reaccumulate after closure, the future only will tell. So far the reports have been very favorable but it is rather early to pass judgment.

The counter-drainage method.—At the North Chicago Hospital we have during the past five years employed a method of draining empyema which proved most satisfactory. It was introduced by Dr. George Dohrmann and carried out in some 30 cases, with only 1 death. (A child died suddenly on the fourth day after operation, cause unknown.) The remaining cases closed without any recurrence. The method is the following: A section of about one inch of the eighth or ninth rib is resected posteriorly under local anesthesia. The pleura is exposed and incised about one-half of an inch. Before any pus can escape, the index finger is pushed through into the pus cavity, thus almost entirely blocking the opening against escape of pus. A curved artery forceps is then inserted along the index finger and directed anteriorly and downward to

the lowest point of the empyema cavity. Pressing the tip of the forceps against the inner chest wall, between the ribs, will raise the skin and indicate the place for the counter incision, which is quite easily made under local anesthesia by the assistant. A soft rubber catheter, No. 12 or 14, is then grasped with the forceps and pulled through. This catheter has three or four small openings in the center. A large size rubber tube is then slipped over the catheter and introduced into the drainage opening of the resected rib. This rubber tube is sewed to the skin, so as to make it air-tight. A glass connecting tube is then fitted into the large rubber tube, which drains the pus into a flask, either through suction or natural gravity. The patient is allowed to sit in a recumbent position in bed immediately after the operation. Four days later the large tube should be removed; the catheter remains in place and drains from both sides for two weeks. By this time the discharge has usually greatly diminished and we are ready for a new step in the after-treatment.

A tape about one-quarter of an inch in width is attached to one end of the catheter by means of a silk thread and the catheter is withdrawn, thus pulling the tape into its place. This tape then serves as a drain for the cavity, similar to that of a "seton." The tape is soaked in a 20 per cent argyrol solution before its introduction. This tape is left in the cavity until the discharge of pus ceases, and this has been the result in practically every case in which this method has been employed.

The three steps of the after-treatment are illustrated in Figures 11, 12, and 13.

I would place this operation second to that recommended by Major McKenna, because it is not quite as simple as his. I describe it here because the end-results of the counter-drainage operation have been so satisfactory, and should this simple drainage by means

of a catheter not accomplish the final results, the counter-drainage operation would then be the one most likely to be adopted.

In regard to simple drainage such as we have been accustomed to do, I wish to offer a few suggestions: first, that the most advantageous location for introducing drainage is posterior and as low as possible, preferably the ninth rib, providing it is certain that the cavity extends that low. If the angle of the diaphragm and chest wall is obliterated by adhesions, the insertion of the tube may have to be higher and the eighth or seventh rib may be chosen of necessity, but by all means it should be done posteriorly. I recommend posterior drainage for two reasons: It is the most desirable point for draining in the lying as well as the sitting posture. Most of the chronic persistent sinuses after resection that have come under my observation have been on the anterior chest wall, along the fourth or fifth rib, or in the axillary line, sometimes as high as the arm pit. Very few cases persist in draining when the opening has been made very low posteriorly.

In introducing a large rubber tube, care should be taken that it does not protrude too far into the pleural cavity. If it can be fixed so that it is just level with the inner chest wall, it will prevent the friction of the lung against the edge of the rubber tube. The suction method for re-expansion of the lung is to be highly recommended, but it must be done systematically and without any undue force.

Local anesthesia should be employed almost exclusively. I shall not waste any time in describing the technic of resection of the rib for empyema, but I cannot refrain from mentioning one point which has been very helpful to me, namely, instead of making a straight incision over the rib which is to be resected, I make a curved incision and thus the field is opened up and the operation performed much more quickly.

RAPID CLOSURE IN AFTER-TREATMENT

What shall be done to produce disinfection and closure of the pleural cavity in the shortest possible time?

The flushing of empyema cavities with disinfecting fluids was extensively used until about fifteen years ago. Weak solutions of permanganate or iodine or boric acid were the favorite solutions employed. The practice was then discontinued until during recent years when Doctor Carrel renewed the interest of the profession in this treatment by showing his good results from flushing infected wounds and pus cavities with what is now known as the Carrel-Dakin solution. The pros and contras for this method are very numerous. The method is on trial. Judging from the reports in the literature, the results will justify its employment in the future. Personally I have had too little experience with it to justify any definite conclusions of my own. As to its technic, I refer the reader to the description by the Empyema Commission[1] in its report in the *Journal of the American Medical Association*. One of the most important advantages of the use of Dakin's solution which I have observed in the cases in which I employed it, was its solvent action on fibrinous adhesions of the lung. It was noted that many cases of empyema which had recovered retained blocked-off abscess cavities due to fibrinous adhesions of the lung. The employment of the Carrel-Dakin solution dissolved these adhesions and the pus cavity was thus opened, emptying its pus into the main cavity, from which it drained freely. This, no doubt, saved a great many from secondary operations. I desire to illustrate a typical case of this nature:

A man of thirty, previous health good, became suddenly ill with an infection of his throat. Severe pneumonia followed. The temperature was 103° to 105° for ten days, at the end of which time the left chest was filled with a fluid. After probatory puncture (pus with numerous streptococci),

an inch of the ninth rib was resected posteriorly under local anesthesia; a counter-opening was made at the same time anteriorly, and a large perforated catheter was introduced, passing through both openings. This drainage was kept up for two weeks. The patient improved rapidly, the pus gradually becoming thicker and more purulent. The catheter was then removed and the cavity injected with 300 grams of bismuth paste, a mixture containing 10 per cent bismuth subnitrate and 90 per cent vaseline. A set of stereo-röntgenograms was taken with the patient in a horizontal position. From a single röntgenogram we would judge that the entire left chest cavity is filled with the mixture. The stereoscopic set of röntgenograms, however, definitely proves that this is not the case. We note that the mixture simply gravitated to the posterior surface of the pleural cavity, producing a shadow covering the greater part of the left chest. (Plate I.) The mixture does not fill the entire depth of the pleural space; the heart and the retracted lung are in front of it. This fact can only be visualized by the stereoscopic röntgenogram, the single plate is misleading. The interesting finding of another abscess, and proof of this is given in another röntgenogram, patient in the sitting posture. (Fig. 14.) The bismuth mixture has now gravitated downward and left the upper two-thirds of the cavity empty and thus transparent. The mixture accumulated at the bottom, giving a square shaped shadow. *A*. We note, however, that a portion of the mixture has been retained in a pocket in the upper anterior portion of the chest. It evidently ran anterior to the lung at the apex. The mixture here gives a distinct outline of a locked-off abscess, with a distinct waterline mark on its upper margin, *B*. Such röntgenograms as this are essential for a correct diagnosis and greatly facilitate the treatment.

It will depend upon the final results whether the irrigating method will become a permanent armamentarium in the treatment of these cases. We must take into account, that heretofore we have been accustomed to promise our patients a closure of an empyema in at least 19 out of 20 cases and this was done when we treated them by simple drainage without irrigation. If the irrigating methods will produce better results than that, they will retain their place; if the percentage of discharging sinuses will be larger than before, the pro-

fession will be tempted to return to simple drainage without irrigation. We must not be misled by some adverse reports on the Carrel-Dakin solution, for it is quite possible that some did not obtain the desired results because they did not follow the technic laid down by Carrel in its finer details. If one desires to employ another man's method, he must follow it to the letter and not try to make modifications of his own. I believe this has been the case in the use of the bismuth paste method of treating sinuses. It is, of course, possible that the type of cases with which we are dealing now will not yield the same good results with simple drainage as the cases did in former years, but since there has been no trial made of simple drainage on as large a scale as that of the flushing method with Carrel-Dakin solution, the question is open to investigation.

The cases which do not yield to the flushing method should be treated with the injections of bismuth paste. It is unnecessary here to go into this method of treatment in detail, since I have, from time to time, published the technic as well as the results obtained, but since empyema is now so prevalent and the use of the paste will probably be much greater in these cases than ever before, I believe it will be of advantage to give some of the important points in the correct technic, which is so essential for the attainment of good results. The injection of bismuth paste serves two purposes: first, diagnostic; second, therapeutic.

Diagnostic points.—The various shapes of these empyema cavities can be best visualized by filling them with bismuth paste and then taking a set of stereoröntgenograms. Such röntgenograms will give a clear picture of the size, location, and depth of these cavities. Studying them, we can define with accuracy the boundaries and anatomical relations of the cavity and thus plan our operation and treatment accordingly. In

some cases the pleural surfaces adhere and nearly obliterate the entire pleural space and leave a long sinus leading into a pocket not larger than a crab-apple. (Fig. 15.) The injection of bismuth into the sinus will likewise give a clear picture of the existing conditions. In some instances röntgenograms will show a straight channel from the skin opening in the chest wall leading directly into a bronchus, which indicates that the pre-existing cavity has shriveled down to a straight sinus, but did not close on account of the communication with the bronchus.

The introduction of the catheter into an empyema for the purpose of estimating the extent or size of the cavity is not a reliable one. I prove this by exhibiting Plate II.

In this particular experiment I have introduced two catheters alongside of each other into the opening, in order to ascertain whether they will lie parallel after introduction. A view of the stereoscopic röntgenogram clearly demonstrates the fallacy of trying to ascertain the boundaries. One of the catheters runs up into the apex and makes a small curve, and the other curls upon itself and points downward after it has reached halfway into the empyema cavity.

Multiple abscesses in the lung may be shown by injecting them with bismuth paste, even if they communicate with the bronchi, because they very often communicate and septa only separate these cavities. (Fig. 16.) I also wish to illustrate a case in which two abscesses, one above the other, distinctly outlined, which do not communicate, appear in one lung. (Plate III.)

To determine the presence of a communication between the abscess cavity and the bronchus the injection of bismuth paste is most dependable, because the patient will cough up the mixture. As soon as the existing cavity has been completely filled, the overflow will

penetrate into the bronchus and the patient will get a coughing spell during which he will eject some of the paste. A word of caution is here necessary, namely, that the paste should in such case be injected very slowly and the patient asked not to inhale during this injection, for he may aspirate some of the mixture into the other side of the lung, while it is passing up through the trachea. It may also produce a choking spell if a large amount of the paste is forced into the trachea. For this reason the mixture must be liquid. We realize that as the trachea is several inches long and its lumen not very wide, it is very easy to clog up this lumen by a column of thick paste and the patient would be unable to inspire any air whatsoever. When there is an accumulation of pus in the abscess cavity the paste mixture will displace this pus, drive it into the bronchus, and the patient will cough up a quantity of pus before any paste will appear in the expectoration.

It is of course absolutely necessary that when a foreign body is the cause of the abscess that it be localized before any treatment is attempted. Here the stereoröntgenogram is almost indispensable for the determination of the exact location of the foreign body. An extensive study of this subject will be found in my publication entitled, "The Localization of Foreign Bodies by means of Stereoröntgenograms," published in the *Stereo-Clinic,* in 1917. Without the help of stereoröntgenograms I should have been very much handicapped. These have been a most useful adjunct in my armamentarium for the treatment of chronic empyema.

After a satisfactory anatomical diagnosis has been made by means of these röntgenograms, the next step is to ascertain the character and quantity of the discharge. In some cases it is a green, foul-smelling pus, in some a serous, semipurulent fluid resembling dirty dishwater; in others, a creamy or chocolate-colored

thick pus. The color of the pus depends very often upon the substances which have been used in the treatment. Irrigations of permanganate or silver nitrate especially change the character and color of the secretion. We invariably take a culture and smear of the pus and whenever it seems necessary we inject one or two guinea-pigs with a 10 per cent solution of this pus. In practically all the cases we find the staphylococcus; in addition to this we find the streptococcus in about 20 per cent of the cases. The tubercle bacillus is rarely found in the secretion, even in the cases in which the empyema is positively of tuberculosis origin.

We have made one remarkable observation in this connection, namely, that in the cases known to be of tuberculous origin in which tubercle bacilli could not be found in the secretions, the bacilli would appear after injecting the cavity with bismuth paste and were then present within twenty-four hours in very large numbers in each smear preparation, often as many as a hundred in each field. This surprising finding was verified in a number of cases during the past ten years. These tubercle bacilli, however, differ somewhat in their appearance and staining qualities from those which we usually find in tuberculous sputum; they are beaded, resembling somewhat a miniature chain of streptococci, staining also much darker than the tubercle bacillus usually does. The number of these bacilli gradually diminishes and within 2 or 3 weeks the secretion will be free from the same.

My explanation for the appearance of these bacilli after the injection is the following: The tubercle bacilli live within the walls of the sinuses or the abscess wall and not in the secretions. It requires a local leucocytosis to provoke their exit. The injection of a substance like bismuth subnitrate produces a leucocytosis within the walls and by this means the bacilli are carried out in the discharge. I am of the opinion that the

modus operandi consists in a battle between the tubercle bacilli and the leucocytes, resulting in the death of the bacilli and their expulsion into the secretions. Possibly the same may be true in the case of other micro-organisms and this would in a degree account for the surprisingly rapid sterilization of large infected cavities. I have as yet no confirmatory laboratory evidence of the above theory, but the theory seems plausible and is supported by clinical evidence.

Therapeutic points. Bismuth paste treatment.—This is the most conservative and at the same time the most effective treatment of these chronic discharging sinuses of the chest. This opinion is not based alone on my own experience in over 150 cases but from reports and observations of many large hospitals in this country and abroad, as well as from my observations at the Great Lakes Base Hospital. By this time the bismuth method is well known, and the results from its employment and its dangers are well defined. After ten years of trial it has retained its place and is employed more extensively now than ever. The reports in the literature indicate that at least four out of five cases of the very old neglected suppurative empyemata or lung abscesses may be cured by this simple procedure. Ochsner, of Chicago, reported to the American Surgical Association on June 4, 1909, 14 cases of empyema, all of which had been operated on (two of Estlander's operation) with sinuses in all cases persisting nevertheless. He applied the bismuth paste in each of these cases, with the result that 12 cases healed completely and 2 were still under treatment at the time and very much improved; others have reported equally good results. In my own series of 150 cases approximately 80 per cent were cured by the bismuth injection treatment alone.

Technic of bismuth paste treatment.—Before the treatment is instituted a set of stereoröntgenograms of

the entire chest (plate size 14x17) should be taken in order to visualize if possible the retracted lung, adhesions, thickened pleura, or discover foreign bodies if such be present. The cavity is then injected with a 10 per cent bismuth-vaselin paste.[1]

When the cavity or sinus is completely filled with this mixture, another set of stereoröntgenograms is taken. This set will illustrate the exact size of the cavity and its relation to the ribs and other structures in the chest. The second set of stereoröntgenograms shows that the cavity is entirely filled with bismuth and usually marks the inner boundary of the cavity formed by thickened pleura. The sizes and shapes of these cavities vary greatly; no two are alike.

The paste is not supposed to be retained in the cavity and allowed to remain there for absorption. Many have the idea that the paste serves as a filling substance to obliterate dead space. This is an error which might lead to serious complications, especially bismuth intoxication. The paste is to remain about two to five days and if it does not spontaneously escape, it should be drawn out by means of a catheter attached to a suction syringe.

In order that the mixture may be correctly prepared, I here include a formula and rules by which it has been prepared at the North Chicago Hospital for the past twelve years.

Apparatus.

1. Bismuth subnitrate, C. P.
2. Yellow vaseline (best grade).
3. White wax.
4. Large porcelain mixing-bowl.
5. Spoon.
6. Large enamel jar with cover for storing paste.
7. Several small enamel jars with covers for liquefying paste at time of use.

[1] In former years I employed a mixture containing 30 per cent bismuth subnitrate, but found that the above mixture produces equally good results and is not likely to cause bismuth absorption.

8. Adhesive straps for the covers of the jars, to keep moisture and dirt from contaminating the paste.
9. Water-bath for heating paste.
10. Sterile rubber gloves, towels, etc., for aseptic technique.

Bismuth paste is a 10 per cent mixture, one part of bismuth subnitrate to nine parts of vaseline with a small amount of white wax (2 ounces to 10 pounds of paste). The mixing bowls, jars, and spoon are sterilized; the vaseline is sterilized for twenty minutes in the original container in the autoclave. The bismuth subnitrate is sterile when it comes from the manufacturer and so does not have to be re-sterilized. The mixing bowls and jars must be absolutely dry, as the slightest amount of water produces a curdling of the paste.

The bismuth subnitrate is poured into the mixing bowl and all lumps smoothed out with the spoon. A sufficient amount of vaseline, which is still in a liquefied condition from the sterilizing, is slowly poured into the bismuth, to make a stiff paste. This mixture is then stirred for an hour until it is a smooth, bright yellow, homogeneous paste. This is the most important step in the process and if not carried out carefully, the paste will not be homogeneous.

To the balance of the nine parts of the liquefied vaseline, a small amount of white wax, which has been heated to liquefaction is added (2 ounces to 10 pounds), and then this mixture is gradually added to the thick paste, stirring it constantly. The resulting product should be a light-yellow, smooth, homogeneous paste, which, on cooling, becomes congealed without the precipitation of the bismuth.

At the time of use, small amounts of this paste (8 to 10 ounces) are transferred to small jars, in which the paste is liquefied and from which it is used. These jars should not be more than half full and great care should be taken not to get any water into the paste while heating it.

The syringes that are used are both glass and metal (Fig. 17); the barrel holding from one-half to two ounces of paste. These syringes have different shaped points and nozzles, according to the demands of the case. The syringes are sterilized and kept in sterile towels until they are to be used, when they are filled with liquefied paste.

The treatment should be controlled by repeated bacteriological examination of the secretions. No attempt should be made to irrigate the cavity before the injection. The patient should be placed in such a recumbent position that the sinus opening is on the

highest level. This will allow the air to escape while the bismuth is being injected. A two-ounce syringe is filled with the liquefied paste, the long nozzle of this syringe, as shown in Figure 18, is introduced into the sinus and the paste slowly injected in the cavity. Upon withdrawal of the syringe some bubbles of air will escape. A second syringe full is introduced in the same manner and as a rule this will fill most of the smaller cavities, which is indicated by the overflowing of the mixture from the sinus. At times, however, it requires 10 to 12 ounces, or even more, to fill an empyema. No attempt is made to plug the opening for the retention of the paste. A simple sterile dressing, with a snugly fitting bandage, is applied. A greater part of the paste will escape within 24 hours.

The first injection does not always produce permanent healing. It requires at times repeated injections during several months, but whenever the discharge changes from pus to a serous character, the injection should be stopped, because healing will usually follow. Only when the discharge continues to be purulent should we consider a more radical procedure.

Causes of non-closure of drained cases.—I have tried to ascertain why some cases respond to the bismuth treatment and why others do not and I have come to the conclusion that whenever the cavity holds more than 200 grams it will be less likely to heal by bismuth injections. Cases which communicate with the bronchi are also more resistant than simple empyema. Some cases will heal shortly after the injection and remain closed for a year or two and the patient be in good health, often gaining as much as 30 pounds, and then the sinus will reopen. The injections are then to be repeated. Closure usually follows for another year or two, and the patient may have another relapse after a long period. The patient

often prefers to keep up treatment in this way, not being much inconvenienced and perfectly well in the intervals.

In studying a large series of cases which failed to close, the following causes have been found to be the factors:

1. In many cases the retracted and infiltrated lung tissue cannot expand sufficiently to fill the dead space existing between itself and the rigid chest wall. Nature tries to diminish this space by contracting the chest wall, so that the ribs almost overlap and in many cases there are no intercostal spaces except at the insertion of the ribs at the spine. The diaphragm very often is drawn up two or three inches in its attempt to obliterate the space. The pleura also thickens and diminishes this space to a certain degree. Nevertheless there often remains a cavity holding two or three hundred cubic centimeters of fluid.

2. The pleura often contains micro-organisms which cannot be reached by flushing with any antiseptic solution, and thus the secretion of pus continues indefinitely.

3. At times there are foreign bodies present, such as rubber tubing, which has slipped in unknown to the surgeon and remained there, keeping up suppuration.

4. In cases of abscess of the lung, the tendency to non-closure is greater because there is usually a communication with the bronchus, which is very often dilated, and reinfection of the abscess cavity after drainage keeps up the suppuration.

5. These chronic suppurative abscesses are often multiple, and when one or two are opened, the drainage and suppuration persist in many small recesses, and only communicate through the branches of the bronchi.

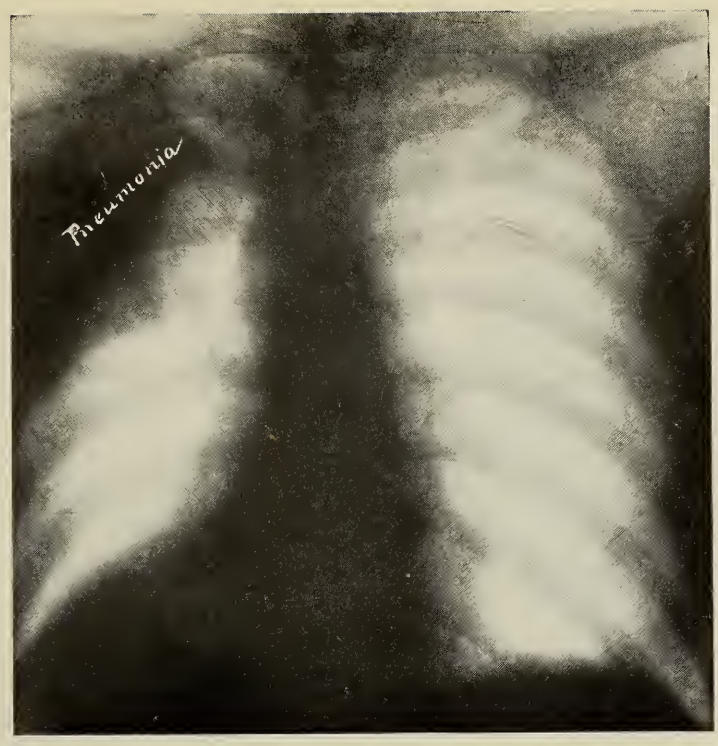


Fig. 1. Unresolved pneumonia. Upper left lobe involved.

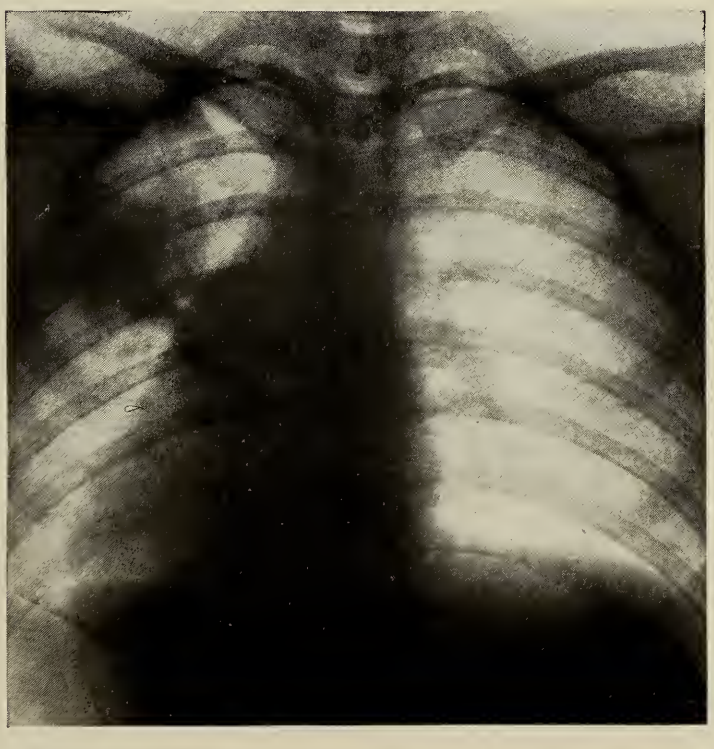


Fig. 2. Bronchopneumonia. Left side involved. Note scattered shadows representing small areas involved.

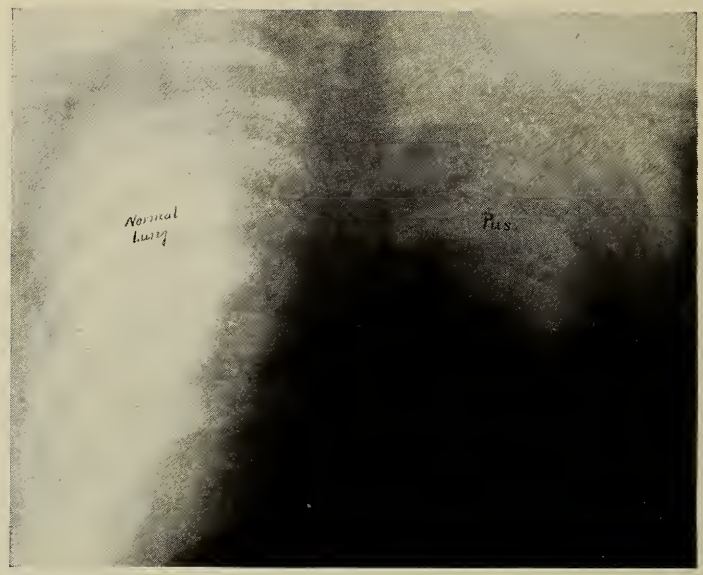


Fig. 3. Right pleura filled with fluid, except extreme apex.

Fig. 4. Empyema. Cavity half filled with fluid, patient in sitting posture. Some paste at the bottom.

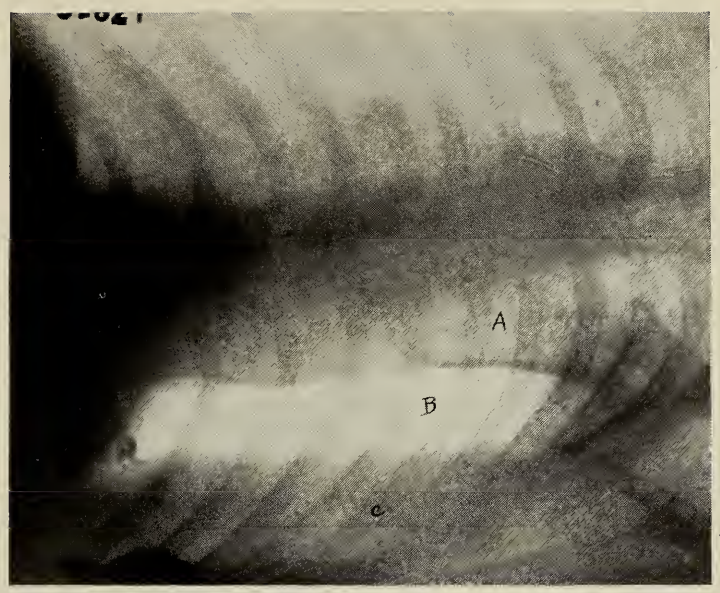


Fig. 5. Same case as in Fig. 4. Patient lying on affected side. Note change in fluid gravitation: a, retracted lung, b, pneumothorax, c, fluid at bottom.

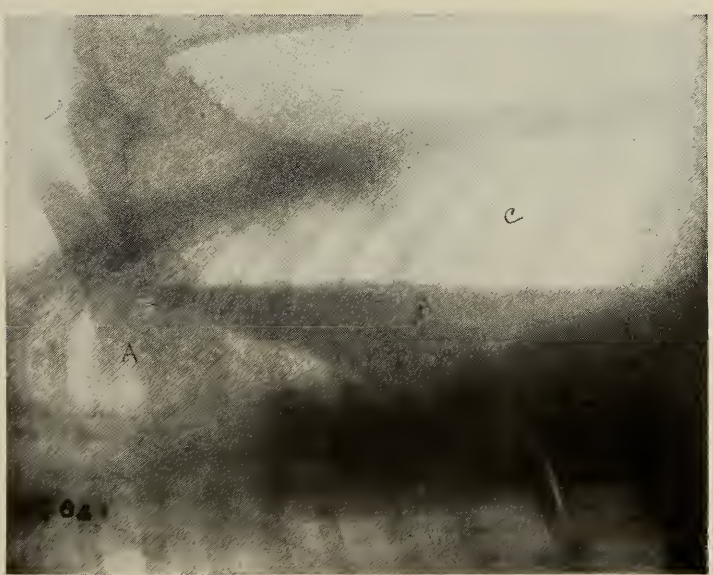


Fig. 6. Same patient as in Fig. 4, lying on unaffected side. Fluid gravitating toward the middle line: a, retracted lung, b, fluid, c, pneumothorax.

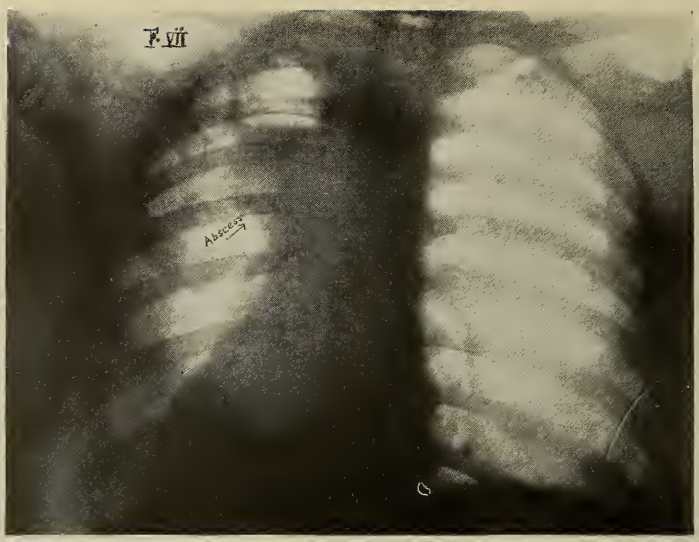


Fig. 7. Long abscess. Somewhat unusual shape, as though it originated in the mediastinum.

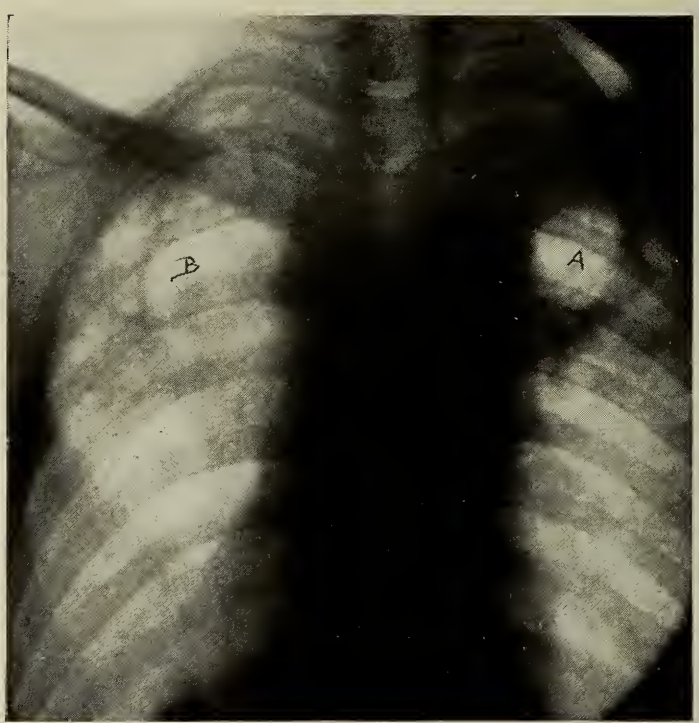


Fig. 8. Tuberculous abscess: a, formation of abscess wall, b, abscess wall not so well defined.

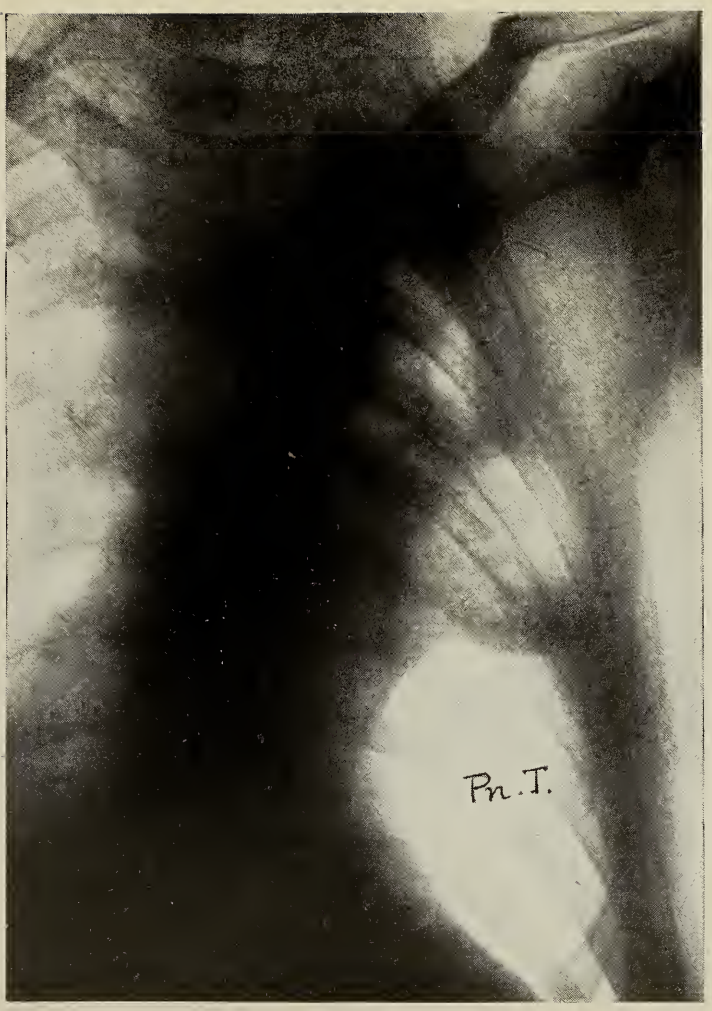


Fig. 9. Pneumothorax. Retracted lung is upward. Cavity below filled with air.

Fig. 10. Röntgenogram showing healed tuberculosis.

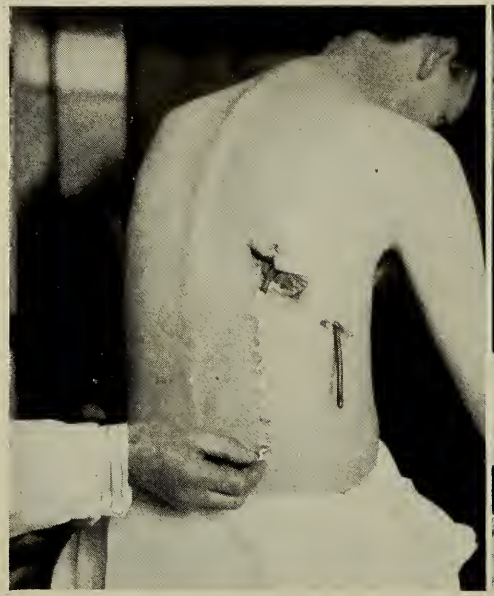


Fig. 11

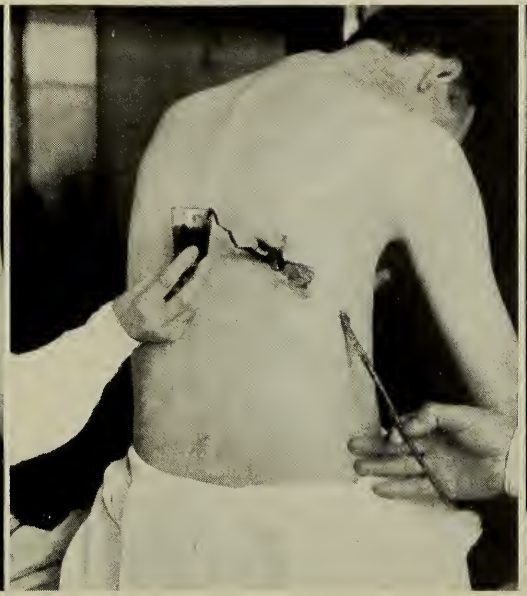


Fig. 12

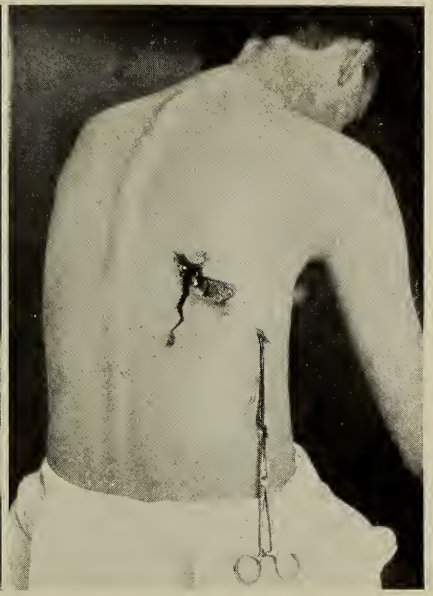


Fig. 13

Fig. 11. First step. Large rubber tube removed. Tape attached to catheter, ready for insertion.

Fig. 12. Second step. Tape soaked in 20 per cent argyrol drawn through both drainage openings by removing the catheter.

Fig. 13. Tape in place, to remain until discharge ceases.

Fig. 14. Röntgenogram showing two separate cavities on the same side: a, bismuth paste gravitating when patient is in sitting posture; b, abscess cavity in front of the apex, filled with bismuth.

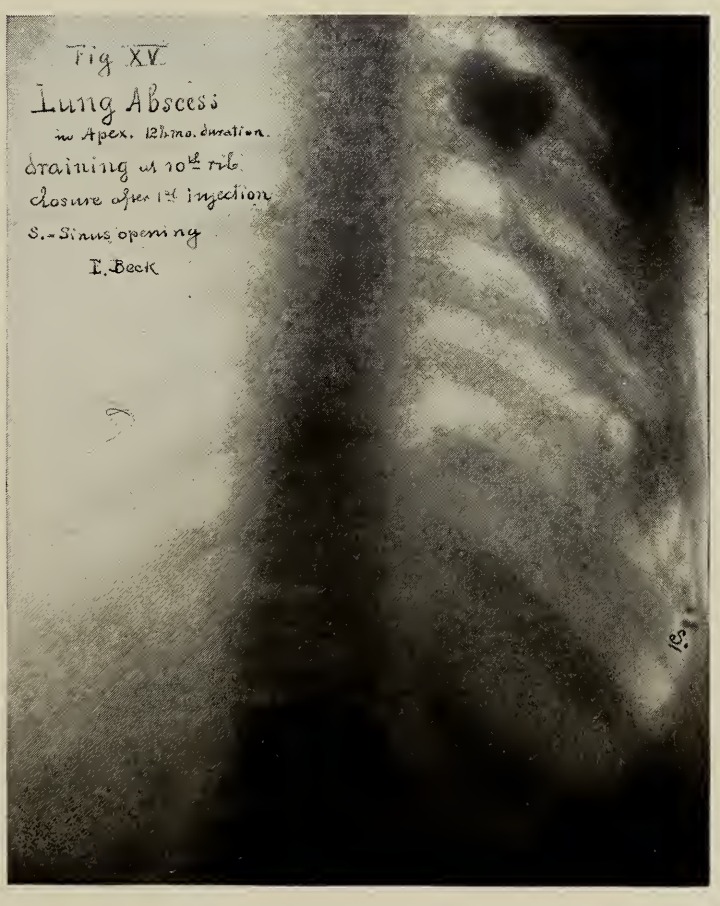
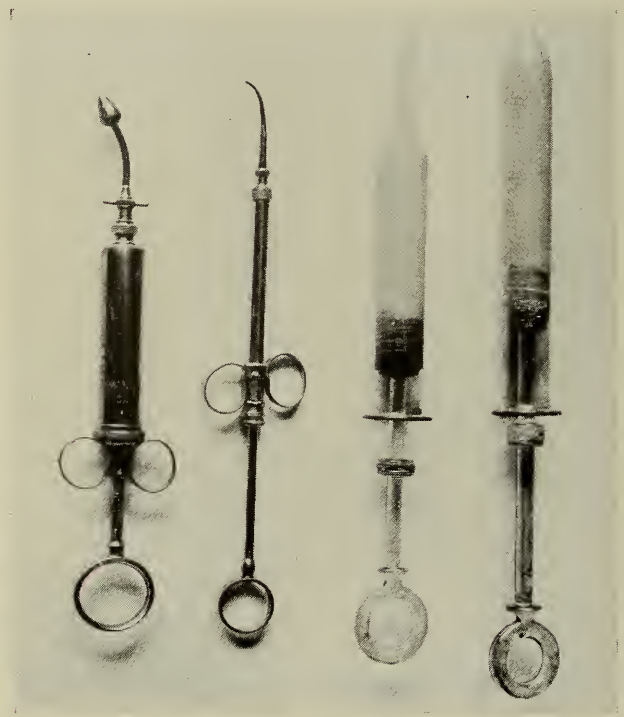


Fig. 15. Long sinus leading into the small pocket in the apex.

Fig. 16. Röntgenogram showing communication of abscess in the lung with the bronchus.



a b c d

Fig. 17. The four types of springes generally employed: a, blunt tip glass syringe, employed in most cases of sinus; b, glass syringe with long nozzle, suitable for empyema cases; c, dental metal syringe used in small sinuses about the teeth and for pyorrhoea; d, metal syringe, olive-shaped tip, used in rectal fistula and small sinuses elsewhere.

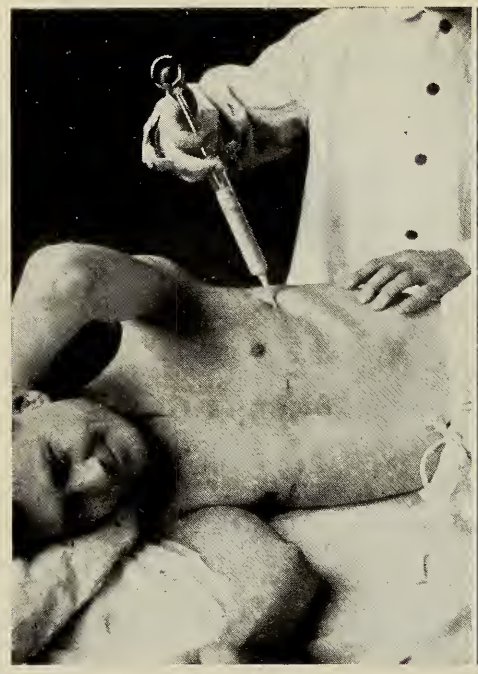


Fig. 18

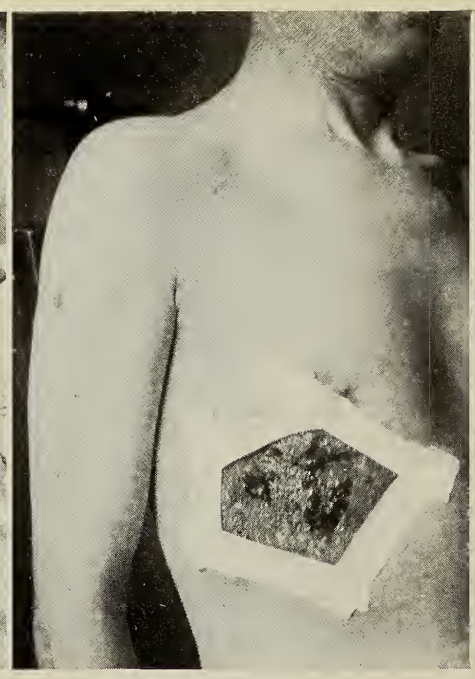


Fig. 19

Fig. 20

Fig. 18. Technique in injecting pleural sinuses.
Fig. 19. Illustrates the application of adhesive plaster around the granulating wound.

Fig. 20. Single drainage before skin-sliding operation. (Case 1.)

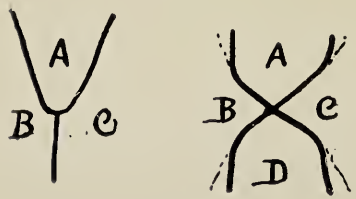


Fig. 21

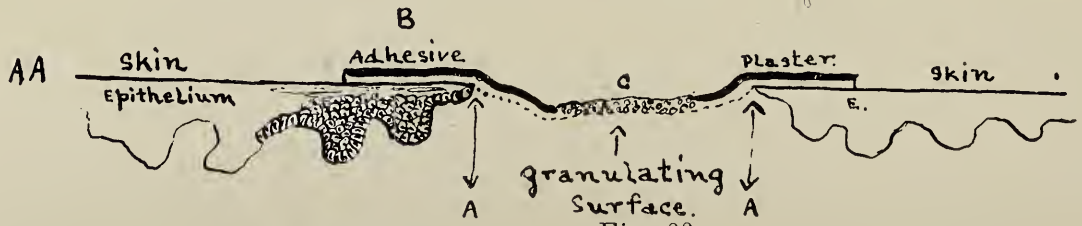


Fig. 22

Fig. 21. Types of incision in skin-sliding operation: Y-shape incision at left: a, long upper flap; b and c, obtuse lateral flaps. X-shape incision at right: 4 flaps of nearly equal size and shape.

Fig. 22. Sketch illustrating the theory of the regeneration of the skin underneath the adhesive plaster: a, margin of growing epithelium; aa, normal skin; b, adhesive covering edges of skin and granulation; c, granulating surface.

Fig. 23. Microscopic section of new growth of skin two years after formation.

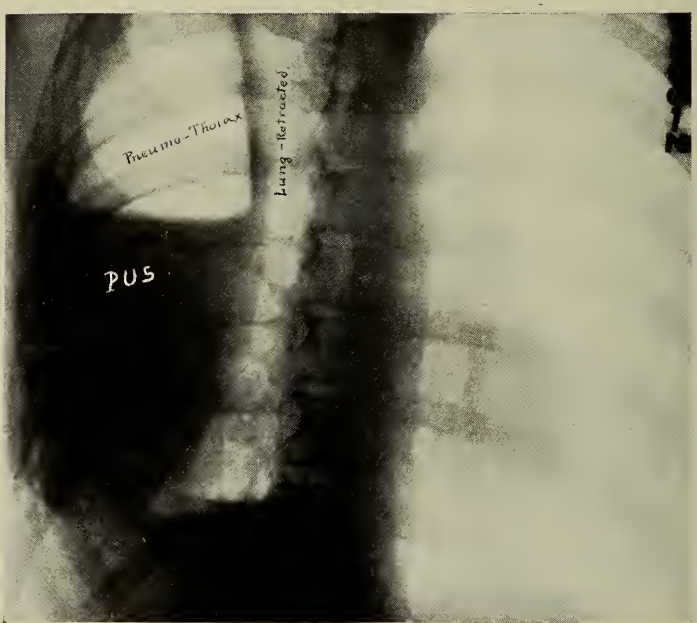


Fig. 24. Röntgenogram of Case 1, showing size of cavity, partly filled with pus. Patient in sitting posture.

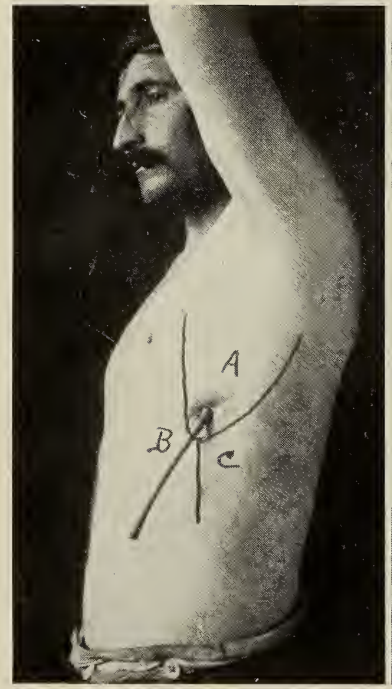


Fig 25

Fig. 26

Fig. 27

Fig. 25. Condition before operation, with sketch of proposed Y-shape incision (Case 2).

Fig. 26. Skin flap, muscles and fat still attached; raised, and pus cavity opened. The floating pus is clearly seen.

Fig. 27. The cavity has been fully exposed, and the muscles and fat have been removed. The skin flap is ready for insertion.

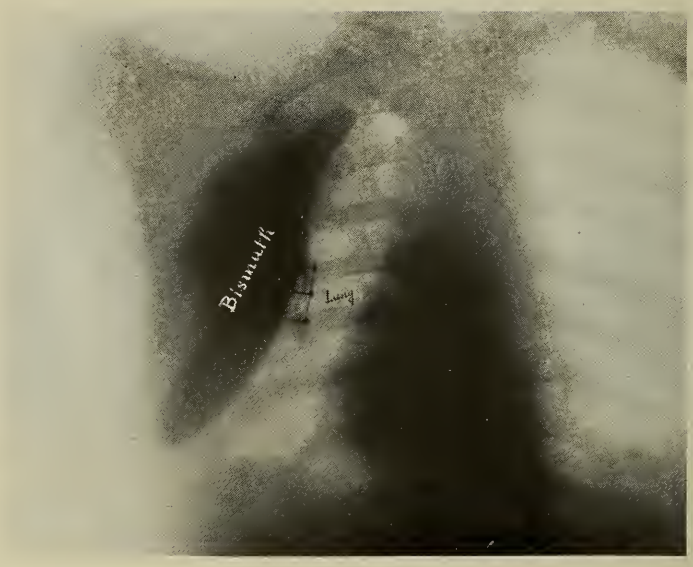


Fig. 28. Size and location of cavity outlined by injection of bismuth paste.

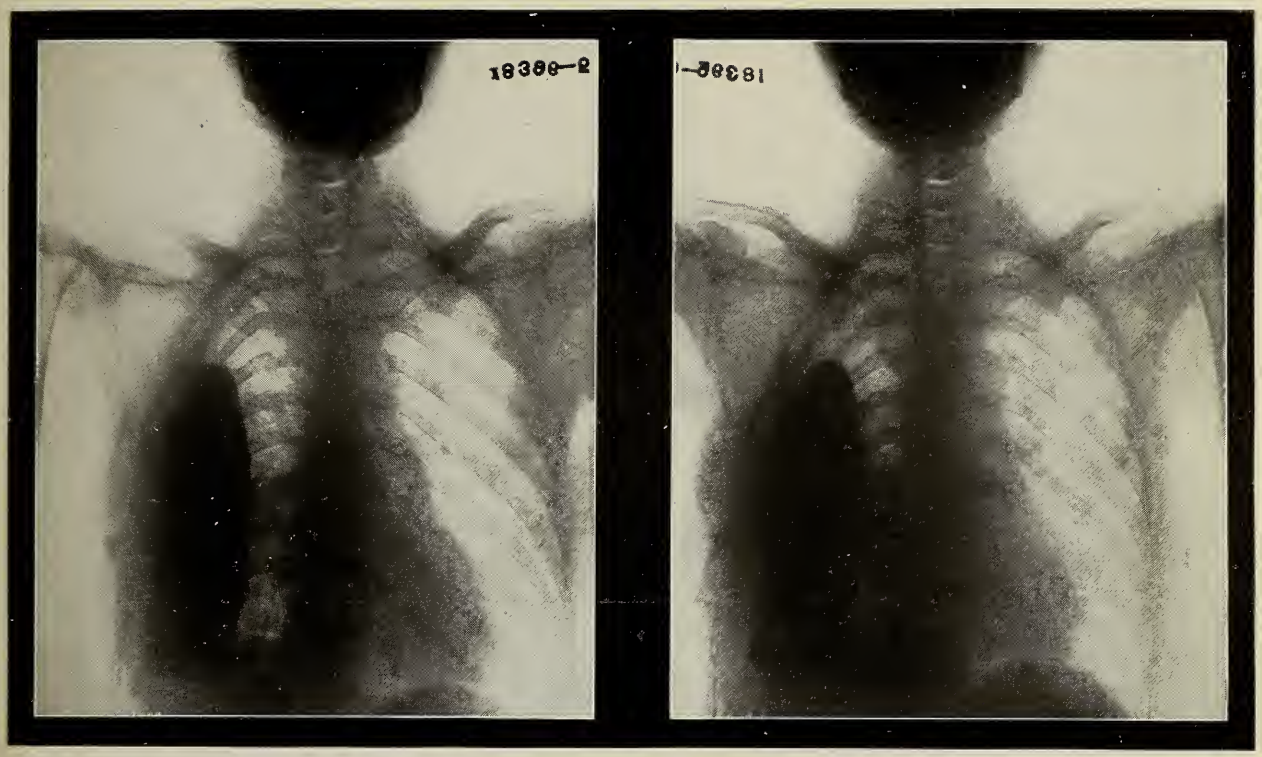


Plate I. Bismuth paste filling the posterior portion of cavity, following influenza.

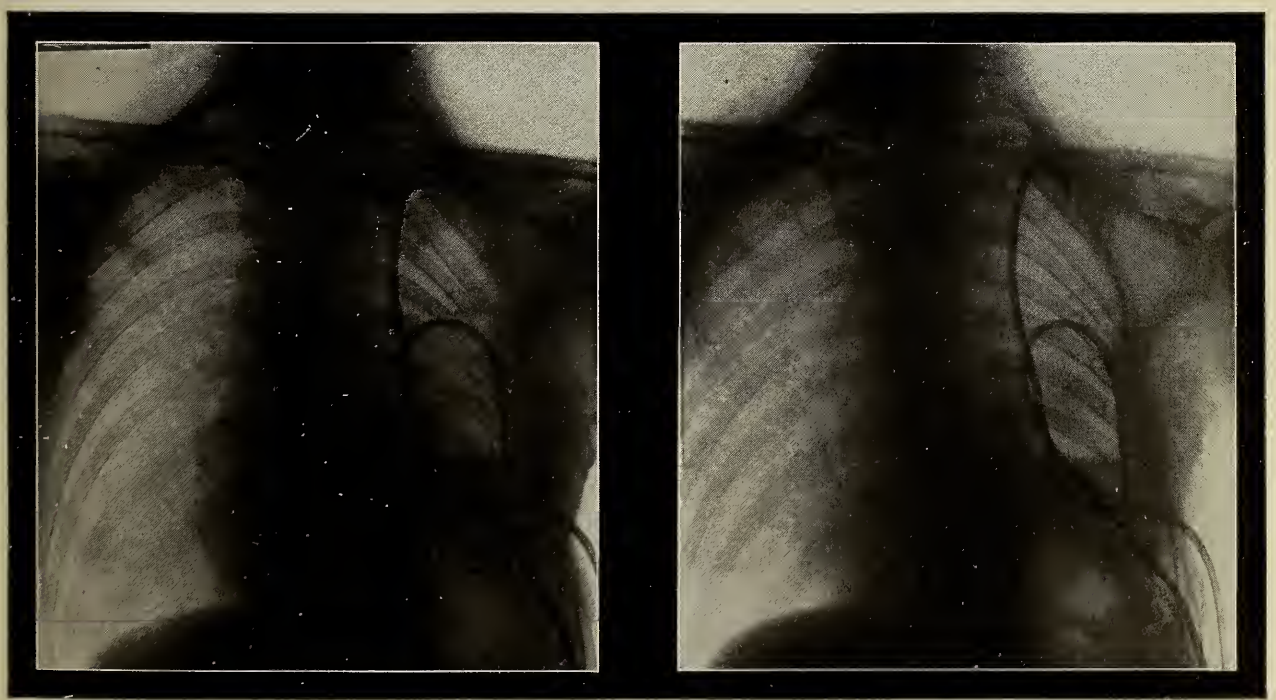


Plate II. Two catheters inserted into one cavity, proving fallacy of estimating size of cavity by catheter.

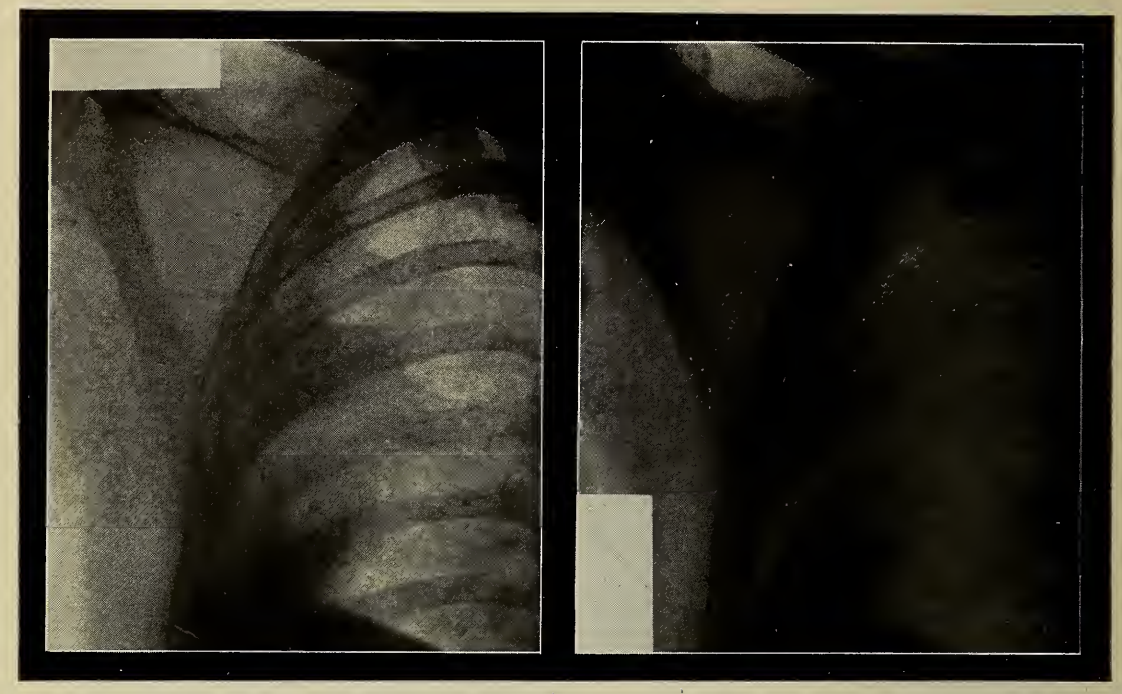


Plate III. Two distinct abscesses not communicating; the upper containing some pus, the lower some bismuth paste. Only stereoröntgenograms will show this condition.

Plate IV. Condition two weeks after skin-sliding operation, showing deep cavity still granulating.

Plate V. Regeneration of skin complete. Patient able to use the arm.

Plate VI. Condition of cavity of second case five weeks after operation. Illustrating also adhesive plaster method of regeneration of skin. Note regeneration of skin on all borders.

6. In abscesses due to tuberculosis of the lung, the reason for non-closure is still more apparent when we consider the pathology of the tuberculous lobe.

Bearing in mind these various causes for non-closure, the treatment in each case will naturally consist in removal of the cause if this be possible. If the cause is not removable, as for instance, the extreme size of the pus cavity, we are face to face with a most difficult situation. The patient has then the choice either of enduring his trouble and being satisfied with daily dressings or of taking the risk of an extensive operation.

WHAT SHALL BE DONE WITH CHRONIC SUPPURATIVE CASES WHICH PERSIST IN SPITE OF TREATMENT?

During the past seven years I have employed a method of obliterating these very large cavities or those which persist in discharging on account of communication with the bronchus, which I believe is simpler and less dangerous than the extensive Estlander, Schede, or decortication of the lung. I have described the same in full in the March 1918, number of Surgery, Gynecology and Obstetrics, p. 259, but since then I have introduced new features in this operation, and in order to make the subject here complete I will recapitulate the essential points of this rather new procedure. I am informed by a number of confrères who have already employed this operation that they have found it very satisfactory.

SKIN-SLIDING OPERATION FOR EMPYEMA

This procedure aims at the obliteration of the pleural space, as does the Estlander or similar operations. It differs, however, in this respect, that in the skin-sliding operation we transform the suppurating cavity into a skin-covered surface, so that it is a continuation of the outer chest wall, while in the other procedures

an attempt is made at re-expanding the lung or caving in of the chest wall to meet the retracted lung.

This epidermization of the exposed lung is accomplished by removing as much as possible of the muscles, ribs, and the thick parietal pleura over the pleural dead space, exposing thereby the retracted lung surface and then initiating the growth of skin over the exposed lung by shifting a long skin flap into the deepest recess within the pleural space. This skin flap will serve as a starting point for the regeneration of the skin from its edges until the entire denuded surface is covered by an epithelial growth.

The regeneration of the skin from the edges will take place if we prevent the granulations from rising too high above the level of the skin edge, and for this purpose we have introduced the adhesive plaster method for regeneration of the skin described below.

The size and shape of the skin flap should be planned beforehand and the incision made accordingly. In most cases I have employed a Y-shaped incision, which produces really three flaps, as shown in Figure 21. Flap *A* is longer and narrower and is intended for the deep recess in the apex, while flap *B* and flap *C* have obtuse angles and will usually reflect over the dome of the diaphragm and the mediastinum. In other cases different incisions, such as the X incision or the "trap-door" incision may be more suitable. These are also illustrated in Figure 21. In order to review the technic of this operation, I cite from my previous publication:

The patient is placed in a semi-recumbent posture and is anesthetized either by local or general anesthesia. Before incising the skin a rubber catheter is introduced into the existing sinus and kept there as a guide. The incision is then made to suit the individual case, choosing one of the incisions illustrated in Figure 21. The flaps at first contain the skin,

fat, and muscles, in order that the skin may keep its circulation, until it is ready to be inserted. Then follows the resection of as many ribs as seems necessary to expose the lung to its fullest extent. Three to five are usually sufficient. This should include, as a rule, the third rib, because this gives us access to the deepest part of the cavity and facilitates the insertion of the flap into the same. The greater part of the pectoral muscles must often be divided or dissected to make the exposure sufficient. A straight incision is then made upward through the pleura, starting from the sinus in which we have placed the catheter and carried to the highest point possible, up to the second rib. The edges of the thickened pleura are then retracted by strong Volsellum forceps and the cavity inspected. All of the parietal pleura is now dissected away clear to the edges of the dissected ribs on either side, but no attempt is made to peel off any of the visceral pleura, or to resect the parietal pleura covering the first or second ribs at the apex. The muscles and fat are now freed from the skin flap and cut off. The tip of the skin flap is then grasped by an artery forceps and carried to the farthest point upward into the deepest part of the cavity so that its raw undersurface lies snugly against the parietal pleura underneath the first and second ribs. Gauze is packed rather tightly against it to keep it in place. In order to prevent retraction of the skin flap, the forceps may be kept *in situ* for 24 hours, the gauze packing keeping it in place. Another precaution may be taken by fastening the skin by means of a stitch taken through the base of the skin flap to the tissues over the second or third rib. It may be advisable to introduce a small drain beneath the base of the skin-flap to prevent the possibility of suppuration underneath the flap. At this stage the operation is completed. The two lower skin-flaps require no special attention; they will adjust themselves.

During the entire procedure it is rarely necessary to use any suture material. The operation should not take more than 100 minutes, in the more extensive cases, and can be done in less than 60 minutes in the less extensive ones.

After-treatment.—The packing should not be removed for forty-eight hours. By this time the flap will be firmly adherent. It is best, however, to take the precaution to keep a spatula in contact with the skin flap, so that it will not be torn off in removing the gauze. The removal of dry gauze may sometimes be so painful as to necessitate a gas anesthesia and for this reason we introduce at the second dressing gauze strips which have been soaked in vaseline. Within one week the raw surfaces, including those which have been caused by the denudation of the skin, will be covered sufficiently by granulations to begin the application of adhesive strips for skin regeneration. The method is as follows:

The zinc oxide adhesive plaster as an aid to skin regeneration.—This consists in pasting adhesive plaster strips about a half to three-quarters of an inch in width, along the edges of the granulating wounds, so that the margin of the skin, as well as the granulation surface is covered, (Fig. 19.) The adhesive plaster serves the same principle that wire does for a vine; the granulations will be kept down to the level of the margin of the skin and the epithelial cells will regenerate along the under surface of the adhesive plaster, (Fig. 22.) On removing the first dressing of the adhesive strips we will note a bluish margin along the edges of the skin, which represents the new growth of cells during the twenty-four hours. The adhesive plaster is not put on at the next dressing but plain gauze is applied, in order to give the newly formed growth a chance to become more substantial. Thus the adhesive plaster is applied every second

dressing, or every forty-eight hours, alternating with gauze dressings.

It has been questioned whether a true regeneration of epithelial cells takes place, since some of the new formed skin resembles scar tissue. We have proved beyond doubt that true regeneration of epithelium does take place, which proof will be published in a special article. However, we here wish to illustrate the microscopic sections of some of the newly formed skin removed from cases in which we performed secondary operations in which epithelial regeneration took place. (Fig. 23.)

For illustration of the skin-flap operation I desire to cite two typical cases:

Case 1.—*Chronic empyema,* 10 years' duration, with drainage. Miss F. L., age 19, developed an empyema on the right side at the age of 9. This was drained and she was apparently well until she was 14; then she developed fever and pain in the right chest. The chest was reopened and large quantities of pus evacuated, whereupon the wound healed up again. Shortly after, fever again developed and it was then advised to drain permanently as shown in Figure 20.

She came under the care of my brother, Carl Beck, in June, 1915. Injections of bismuth were tried for a time and the condition improved but the cavity was so extremely large that a permanent obliteration could not be expected. (Fig. 24.) Therefore, on February, 1916, Carl Beck performed a modified Schede operation. A circular flap and the muscle were dissected down to the ribs and a part of the fourth, fifth, sixth, and seventh ribs was resected anteriorly. The pleura was then incised at the seventh rib, where drainage had been established, and the incision continued up to the third rib. The cavity was packed with several pieces of gauze and the wound temporarily closed with three stitches of catgut.

The second step of the operation was done ten days later and this consisted in trying to obliterate the space by pressing in the right breast. This procedure, however, was not found effective, since the cavity itself reached far into the apex, and besides the pleura was constantly secreting pus. He therefore decided to denude the skin from the breast, making a large-size flap, amputating the breast and the pectoral muscles and shifting the skin flap up into the apex. This

was done in May, 1916. No attempt made to produce lateral flaps.

The entire denuded area was left uncovered for the adhesive plaster method of reconstruction of the skin. (Plate IV.) Healing took place rapidly and with the aid of adhesive plaster the entire cavity was now lined with skin, entirely dry, and the girl is in perfect health and able to do general housework. She has no deformity of the spine, only the unsightly depression in her right chest wall (Plate V), which of course is only visible when she is undressed.

Case 2.—*Chronic empyema,* draining 3 years, complicated with acute influenza-pneumonia.

A Bulgarian laborer, S. K., age 33, developed empyema in 1915, and drainage was performed two weeks after an illness which was probably pneumonia. This left a small sinus draining anteriorly, as shown in Figure 25.

The previous treatment of this case consisted in irrigations and also injections of bismuth paste (Fig. 28), which improved it for six months, during which time the sinus was closed and then reopened. It was finally decided to do a skin-sliding operation. A Y-shaped incision was made, such as is shown in Figure 25. The two principal steps in the operation are illustrated in Figures 26 and 27. The first one illustrates the resection of the skin flap, including the muscles (for those are not to be removed until the skin is to be shifted into the cavity), the pleura is already opened and we notice the floating pus within. In the second we have already dissected away the muscles and widely exposed the pleural cavity. The skin flap here is being held up by two forceps. This upper flap was inverted and pushed against the under surface of the remaining chest wall, thus adhering to the parietal pleura. The entire cavity was then packed snugly with gauze, to keep the skin in close contact with the pleural surface and favor adhesion.

Subsequent history.—The patient did very well for five days. On the fifth day he developed all the symptoms of influenza, the epidemic in the meantime having begun in Chicago and a number of the nurses as well as patients having contracted the disease. The temperature rose to 105° and 106° within twenty-four hours and all the symptoms of an acute pneumonia in the exposed lung developed. We could watch the inflammatory condition by ocular inspection. The thickened pleura which covered the lung at the time of operation became now a transparent, succulent membrane with a whitish covering, congested blood-vessels, and in some portions dark

spots like gangrenous areas were developed. Twenty-four hours later a hemorrhage took place from the surface of the lung, which was controlled by the application of Monsell's solution and the lung was tightly compressed with gauze, which was kept in place by adhesive plaster.

We could now observe the progress of the disease during the daily dressings. Hemorrhages took place during the dressings sufficient to be alarming. The patient, however, did not succumb to this affection. After two weeks he began to gain, the lung gradually changing to its former appearance and granulations forming around the edges of the lung.

I illustrate in Plate VI the present condition, the case being still in the hospital. Regeneration of the skin is taking place rapidly, so that I expect a complete and similar result as in the former case cited.

COMMENTS

This method of treatment of apparently incurable empyemata is still in the developmental stage and will no doubt be developed to greater perfection, but I am certain that it has a great many advantages over the extensive operations which have heretofore been performed for this condition.

Since there is no suturing done in this operation after the resection of the rib and excision of the pleura, the operation is completed in one-half the time that we would require in the Estlander. We are finished with the operation just about the time when we would expect to have the greater part of the work before us.

SUMMARY

1. The treatment of empyema has, through the occurrence of new types, become a new problem and on account of its enormous prevalence will require a revision and modification in methods of treatment.

2. The correct treatment of the early stages will prevent the majority of the chronic suppurative sinuses.

1. Dr. Kruescher's personal communication.
1. J. Am. M. Assn. 1918, Aug. 3, 367.
1. J. Am. M. Assn. 1918, Aug. 31, 743.
1. J. Am. M. Assn. 1918, Aug. 3, 372.

3. When sinuses persist in spite of all previous treatment the bismuth paste, if correctly applied, will eliminate approximately 80 per cent of such cases.

4. The residue of such cases as are not amenable to the bismuth treatment may be cured by the skin-sliding operation, provided the technic is followed as outlined in this paper.

DISCUSSION

Dr. Joseph Ransohoff (Cincinnati, O.): Knowing that I was interested in the subject of empyema, my colleague asked me to take charge of all the cases in the hospital. We had twenty-three at the last count, and have more now. We operated on one or two patients a day, and of those operated on two have died as the result of operation. One died on the table before anything was done. I think patients with empyema are often operated on in such a position that they lie upon the sound side and the entire weight of the fluid lies upon the mediastinal tissue, and, if the fluid rushes out, the air gets in there with such force that there is apt to be a pronounced change, particularly of the inferior vena cava, and that sudden death is apt to occur. So I have ordered that all these patients be operated on while on the stomach. They breathe better in that way, and I think it more comfortable. If they gasp for breath they can be much more comfortable in that position than upon the side or back.

All patients, except children, are operated on under local anesthesia. I think we have not had much difficulty in this except when the grip is brought down on the rib to divide it the patient complains of pain. We have tried to anesthetize the intercostal nerves as much as possible to minimize the pain.

There are many ways of draining the chest. Until recently all empyemas were simply slashed into, and the pus was allowed to rush out. We should in all cases, so far as possible, prevent the development of a pneumothorax in addition to the empyema which the patient already has. I do not know whether to claim any credit for the drain I am using. It is extremely simple. What I use is a drainage-tube about as large as this piece of chalk, not long, just long enough to go into the interior of the chest. It should be nearly flush when it enters with the pleura on the inner side. Attached to this I have a collapsible tube of the same sort that is used for the

cigarette drain. This is run in as far as necessary. It can be made water-tight, can go out or go in, flush with the pleura, and there is no difficulty in allowing the pus to escape, as it will. This should not all be removed at the first sitting. When the patient first leaves the operating-room there may be four-fifths of it in the cavity. Put on a clamp, and put the end of the tube in a bottle with a little lysol. It is interesting to see the beautiful blowing of the inspiratory effort on the distension of the collapsible tube. I think in many instances the mistake of leaving in too much tube is made. If there is too much you are sure to irritate the parietal pleura.

Among these twenty-five cases we have had one double empyema which is now about ready to be discharged.

There is another thing that we institute within forty-eight to seventy-two hours to help the patient expand his lung: In our wards we have perhaps eight or ten Wolff bottles, not enough to go around, but we give each man his pipette to blow through. Every day I find the men can expand their lungs better. It may take ten one day, eight the next, and the next day six, to get the lung to expand, and I think that is one of the most important things in getting rid of an empyema.

We are thoroughly gratified with the results we have achieved. I see no reason for adopting the method of injecting something to sterilize the pus. We all know what it means if sterile pus stays there. It means that within twenty-five years it will become infected again. I saw one man twenty-five years after the Civil War with necrosis of the scapula. Another man had been shot through the trochanter, and twenty-five years afterward got an empyema. Why should we leave anything in the chest that we can get rid of, particularly if that sterile fluid is going to interfere with anything, and it will interfere with the lung capacity, and my objection is to leaving any of that fluid? What we wish is to get the chest to expand as soon as possible. If we delay it, what will happen? I saw one man in January who had an empyema in one of the camps. I was asked to see him. I begged to be permitted to do a drainage, but was refused. They made a little opening here for an injection, and that was kept up for six or eight weeks without any benefit. The man went south, and there got an attack of pneumonia on the other side. What chance did he have with that one lung bound down?

Dr. A. E. Hertzler (Kansas City, Mo.): I would like to say a word about the diagnosis in an alleged appendicitis. I do not know what opinion you may hold about the distribution of the phrenic pain, but I have noticed that in these patients if you test the degree of muscular pain and tenderness, and then compare that with the pain that you will get by pressing upon the lower border of the ribs, you get more pain up here than you do down below. The question of leukocytosis does not count at all. The lung may be clear at the time you are called to do the appendectomy, but if you wait around two or three days you will find evidences of low-grade pneumonia just above the diaphragm.

Dr. Arthur T. Mann (Minneapolis, Minn.): We have had some very interesting experiences in the base hospital of which I spoke before, and of course had a large number of cases of "flu," as I told you—something like eleven thousand—and pneumonias developed and the other complications. The first question was the question of the germ. We concluded that all the complications were due to some secondary infection, as the writer of the paper did. While the laboratory was not able to recover the "flu" germ, the bacillus of Pfeiffer, at first, they felt that it must be there, and very early changed their technic so that at the autopsies we began to select the little spots of lobular infection and cut them out en masse. From these cultures we practically always recovered the bacillus of Pfeiffer. So it seems that with us at least the influenza was probably due to the Pfeiffer germ. The most common secondary germ was the streptococcus hemolyticus, and it was virulent. The pneumonias were due to that in a large majority of the cases, and many of the empyemas. Pneumococcus pneumonias and pneumococcus empyemas were comparatively rare.

In regard to the empyemas themselves: These were at first serous pleurisies. We came to the conclusion that an early operation was not a good thing, so these patients were aspirated, and the aspirations were continued whenever the accumulation of fluid was over 500 c.c. Beyond that they were treated expectantly.

We learned a very interesting thing there in regard to diagnosis. As the military portable *x*-ray machine is very carefully focused, it could be taken to the wards, and the chest pictures taken in the patient's own bed without removal. When we got the pictures back to the laboratory we very

frequently could not tell these pictures from the ones of patients brought to the laboratory upon whom the finer instruments had been used. So we soon began to rely on the portable apparatus. We found that with this the *x*-ray man could make a diagnosis before the medical officer in regard to a penumonia. He could show these spots of the lobular pneumonia in many instances before the clinical man had discovered them. That was a step forward, and we learned to rely upon him for that. Practically all these pleurisies had the streptococcus and mostly the streptococcus hemolyticus. They were aspirated until pus showed, and when pus showed we went through a series of changes again. We found soon that a resection of the rib was not the best thing, and that a simple incision between the ribs gave very good results, and was much better borne by the patient. So no patient had resection after we found that out, which was very early. Then we tried various things: the aspiration and injection of Dakin's fluid through the aspirating needle and then the withdrawal of that; then the dichloramin T and the aspiration; then the solution of Murphy, 2 per cent of formalin in glycerine, which stood at least 24 hours to diffuse the formalin, but soon gave this up. The next move was not to make any incision at all, but to use a rather large trocar, insert the catheter, and withdraw the tube, getting negative pressure. I had to leave that post so I don't know just what the results were, but a recent letter from the post stated that they had beween forty and fifty of these cases on hand at that time, and that this was probably the best method of treatment combined with Dakin's fluid.

In regard to the "flu" empyemas: The best operation is in the early cases, where the patients are rather sick, get the invasion rather early, and are full of the toxines. When you come to operative measures if you employ them on the fulminating cases the results are not so good as when employed on the cases with a milder toxemia.

There is another aspect which I studied very carefully and very early, and put a man on it for the entire hospital. I refer to the cases with referred abdominal pains. We had 8,000 men in bed at one time so we had a good many cases. I got into touch with the medical service, and they helped us in referring all cases of referred abdominal pain. This question of referred abdominal pain it seemed to me we had a better chance to study, with such a large group of cases, than anyone had ever had before. We went care-

fully into this. They were at first referred as cases of appendicitis. We found one appendicitis case, and we very early learned to be guarded in our diagnosis in cases which were referred with the "flu" and as cases of appendicitis. Sometimes pneumonia had not been detected, pleurisy had not been detected; and where we could we kept the patient under observation two or three times a day to see that we were not getting into an acute appendicitis that would give us trouble. We found that lung symptoms would develop and the diaphragmatic pleurisy which had given referred pain in nearly all of the cases.

Another class of cases gave us the abdominal pain. In the "flu" at autopsy on some cases which had died I noticed that the intestines were red around in the right iliac fossa, usually the small intestines which were near the cecum, and it seemed to me that some of these cases of pain in that quandrant of the abdomen were probably due to some enteritis from the "flu," or some other complicating thing that came with the "flu." In one case in which we operated we found an abscess and a normal appendix. The abscess went up to the diaphragm at the outside of the colon, and the man had pus in the pleural cavity. We concluded that the pus had worked through and given us the abscess in that way. The case resulted fatally.

Dr. Willard Bartlett (St. Louis, Mo.): I want to emphasize one or two things. In a permanent government hospital where they are dumping a lot of men from the front who had their pneumonia a year ago, and are getting worse off every day, we see the converse of all these statements concerning drainage of the pleura. I have reason to mention the name of Dr. Sam Robinson, who impressed upon us the importance of the first surgeon who opens the pleura to the subsequent condition of that patient. He said the man who first opens the pleura is responsible for any subsequent infection which may arise. We were in the habit of resecting a rib when it was necessary, and, if that was not sufficient, resect two, and most text-books say three are better than two; but after Sam Robinson stated how he bored through a rib and put in a little silver tube, and got an opening smaller than the opening in the larynx, then his positive pressure in the pleura was very quickly changed for a negative where the lung was loose and the pleura not too thick, it was easy to see the advantage of that procedure. In this way the opening is so small that when the patient breathes the air comes in through the larger cavity in the

larynx; we keep them blowing on something to keep the lung blown up, and leave the tube in until when the patient blows he can force no pus into the bottle, nor many bubbles of air, which takes about two weeks and then the tube can be taken out. Unfortunately, I am getting the chaps who have not had the advantage of this treatment. These boys had a rib or two resected, and now have a chronic pneumothorax, often with a scoliosis, but the patient never lives long enough for a complete obliteration—at least I have never seen it.

There are two types of procedure, one destructive of the upper chest wall, the other constructive, decorticating the pleura and letting the lung pop out. I would welcome a little discussion on the work on chronic cases. I have had more experience with the plastic work, which is best done in steps, and I would like to hear a little discussion of the results in such work by other men.

Dr. James F. Percy (Base Hospital, Camp Kearny, Calif.): It is very interesting to me to hear this paper and this discussion because I have been hearing it every day for the last five months. All of these questions regarding empyema are still unsettled. I do not know yet what empyema is, and no one has enlightened us. When you have a chest full of fluid, have you an empyema? The *x*-ray is often very misleading, even when you get a stereoscopic picture. A very experienced internest with his stethoscope and a very experienced surgeon, who is also a well-trained physical diagnostician, plus a good *x*-ray picture, make the best combination for ferreting out these cases. Depending on the *x*-ray laboratory alone has, in my experience, led to many unnecessary needlings, trying to find fluid. I am seeing a rather large number of chronic empyemas, and for some time after we get back to civil practice we are going to have these cases to treat, both medically and surgically.

Dr. Beck seems to have a good deal of confidence that he can differentiate, from his *x*-ray pictures, between a lung that is solid from a pneumonic process and one that contains pus. I will grant that one can do this in the favorable case, but in a large percentage the picture is misleading and will often lead to an unnecessary amount of needling, and this in a solid lungs frequently results in the development of a lung abscess.

Dr. Beck (closing): In answer to the question put by yourself about finding the fluid, I would like to ask if they use stereoscopic röntgenograms? Whenever we employed them, we did not fail to find it.

Dr. Abbott's apparatus seems to be an excellent thing because it acts automatically, and I shall certainly try it.

In reference to the chronic cases: If I had had time I would have spoken of those. They are fully discussed in my manuscript. Since we are going to have so many of these chronic cases, I would like to have the opportunity of demonstrating the skin-sliding operation, and show how easy it is and how beautiful the results. It takes longer for a case to heal, but it is better to have the patient around for a few months than for several years.

I wish Dr. Ransohoff had spoken of the re-expansion of the lung. He is an expert in that work. I fear that in the very old cases, if the lung has been shrivelled for several years, most of it has been converted to scar tissue, and expansion is not possible. Only in recent cases where the vesicles are still patent can we hope to establish re-expansion.

Dr. Mann brought out many new points. I believe the Dakin's solution has a solvent action upon fibrous adhesions, and where there are multiple abscesses they will be thus opened and drained in the main cavity; otherwise, it would be necessary to make multiple openings. Many patients apparently recover from the pneumonia, and the patient will not be aware that he has developed an empyema. In a recent issue of the *Journal of the American Medical Association* a major reported that only one case of empyema had occurred in 1150 recovered from pneumonia at camp. I had my doubts, and satisfied myself by writing to him and inquiring if any more cases had developed since the publication of the article. He replied, as I surmised, that 150 cases of empyema had developed since his publication.

An empyema may absorb, just as a cold abscess does.

What is an empyema? I would say that when the serous fluid has developed into creamy pus where the sediment in a test-tube would be about 50 per cent of the fluid after twenty-four hours, I would call it empyema. We must distinguish an acute pneumonia with effusion from an empyema.

THE SURGICAL COMPLICATIONS IN 1,030 CASES OF INFLUENZA

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The 1,030 cases of influenza in which arose the surgical complications to be considered, occurred in the student body of the University of Iowa during the month of October, 1918. The barrack life of the Students' Army Training Corps is responsible for so many cases among a student population of slightly over 3,000, and permitted an early and close observation of the cases.

On the third day of the epidemic the University Hospital ceased admitting its regular patients, and evacuated as many of its resident cases as could be discharged. This was done to make room for the very sick influenza cases, which were expected to be numerous, and in a few days the hospital was filled with these. Within a week our normal hospital capacity was raised from 350 to over 1,000 by using outside buildings.

In considering the surgical complications of these cases we are struck by the fact that they are few in number and variety, and not very serious. Empyema is the most important. This occurred only in the pneumonia cases, of which there were about 100, and was the cause of death in each of the 33 fatal cases.

Last winter when a very fatal form of streptococcic pneumonia and empyema was prevalent in the cantonments throughout the country, we had a few cases in

the University Hospital, and our experience then led us to dread the development of empyema in this epidemic. However, the percentage of cases of empyema was lower and the mortality not nearly so great. We had nine empyemas, of which two were fatal. These nine patients all had pneumonia when the empyema developed. Five of them were in the active stage of pneumonia when this complication arose, and in 4 the pneumonia was subsiding when the empyema appeared. In 8 the left side was involved, and in 1 the right. In 2 cases the fluid obtained at the first aspiration showed no bacteria, and in these cases an aspiration on the following day revealed the organism. All of the cases had leucocytosis, in contrast to the leucopenia which was present in the uncomplicated influenza patients. In 5 cases the pus contained only the pneumococcus, in 1 case the streptococcus, and in 3 cases the pneumococcus and streptococcus. In these three cases the pneumococci were much more numerous than the streptococci, which were in short chains. In those cases where the type of pneumococcus was determined, it proved to be Type IV. Three of these 9 patients developed double otitis media, and 1 of them also had scarlet fever. In 2 of the cases, a second aspiration of pus was done before drainage was instituted (suggested by our experience of last winter), but in the others the pleural cavity was drained as soon as bacteria were demonstrated to be in the fluid. In the first three cases, with local anesthesia, two rubber catheters were placed between the ribs, but in the others a rib was resected under gas and oxygen anesthesia. I do not consider ether anesthesia to be proper in these cases, but a well-administered gas-and-oxygen anesthesia does not produce cyanosis or shock, and I consider it preferable to local anesthesia except in the most desperate cases.

Empyema was followed by death in two patients, in both of whom it appeared early in the course of the pneumonia, and death occurred while the pneumonia was still active. I believe that the low mortality in these patients as compared with the mortality of the cases last winter is due to the fact that the pneumococcus, rather than the streptococcus, was the predominating organism.

Appendicitis was not a common complication. Many of the patients had the gastro-intestinal form of influenza, and in quite a number of these there were finally pain, tenderness, and rigidity localized in the right lower quadrant. This was marked enough in some cases to have led to the diagnosis of acute appendicitis, and to have indicated operation in ordinary times, but we felt that it was extremely important to avoid unnecessary operations in these influenza patients, that the involvement of the appendix was only a part of the enteritis of influenza, that recovery would take place unless secondary infection of the appendix occurred, and that secondary infection would be shown by the development of leucocytosis. Two of the patients did develop leucocytosis, showing, respectively, 14,000 and 18,000 leucocytes. As soon as it appeared, appendectomy was done in each case under gas-and-oxygen anesthesia.

In the patient with 14,000 leucocytes an acutely inflamed appendix with beginning gangrene of the mucous membrane was found. He developed a postoperative central pneumonia, with irregular fever and slight physical signs, but a very definite area of consolidation, as shown by the *x*-ray. This patient made an uneventful recovery.

The patient with 18,000 leucocytes was found at operation to have a large amount of clear serous fluid free in the peritoneal cavity. The appendix seemed normal except for congestion, which was also present

in the intestines generally. A search failed to show diverticulitis or other cause for the pain and leucocytosis, except a slight, diffuse thickening of the sigmoid. The appendix was removed, and his recovery was prompt and complete. In this case I would account for the considerable amount of free fluid in the peritoneal cavity through the hyperemia of the intestines due to the influenza enteritis, but this does not account for his leucocytosis, and the appendix did not appear to be acutely inflamed. The slight thickening of the wall of the sigmoid leads me to think that he had an inflammatory infiltration of the wall at this point, secondary to the influenza inflammation, and that this sigmoiditis caused his leucocytosis.

Dr. L. W. Dean, head of the eye, ear, nose, and throat department, reports that during the epidemic his department had under observation 37 patients with acute otitis media, of whom 5 developed mastoiditis, requiring operation. In 4 of these mastoid cases the streptococcus was found, and in 1 the identification of the organism is not complete. There were 14 cases of acute paranasal sinus disease, and 12 cases of acute laryngitis. In all these complications leucocytosis was present, except in one patient, who died from pneumonia without having had leucocytosis at any time. Dr. Dean reports that he noted two rather unusual conditions.

1. "The marked tendency to orbital cellulitis in cases with infection of the anterior ethmoids; 3 cases among the 14 with paranasal sinus disease having orbital cellulitis.

2. "The laryngitis cases presented superficial ulcerations with infiltrated bases. In certain camps the same condition has been reported as caused by the pneumococcus independent of influenza."

CONCLUSION

In no case was the influenza bacillus found; therefore it cannot be regarded as the cause of this epidemic. Complications are few, and are probably due to a secondary infection. This is indicated by the fact that leucopenia is present in the uncomplicated cases, but leucocytosis develops almost invariably with the onset of complications.

Whatever the primary cause of the influenza may be, the bacteria mostly concerned in the complications are pneumococci and streptococci.

DISCUSSION

[Dr. Rowan answered some questions as below.]

Dr. Rowan: In regard to the causes of abdominal pains in influenza: I well recognize that many of these pains do exist, and are caused by a condition above the diaphragm; but apart from them we do have a good deal of abdominal pain, and it is not safe to feel that every case of abdominal pain comes from above the diaphragm. We have seen a good many cases of the gastro-intestinal form of influenza where there were vomiting and severe diarrhea with pain well localized, in some cases, to the right side, where there was no evidence of pneumonia, no empyema, and the patient recovered. We should be on the lookout and not make light of abdominal pains, because if we do, once in a while we will make a mistake.

As to operating on pleurisy: I do not think we operated on any pleurisy. The only cases requiring operation were empyema referred from the internal medicine department, where the diagnosis had been made by very conservative men. The question comes, When does a pleurisy cease to be a pleurisy, and become an empyema? I was willing to take the internist's word; although the gross appearance of the fluid in many cases indicated pus, we could not find the organism on smears, and where there seemed to be empyema with thick pus we waited until the organism appeared on smears.

CARCINOMA OF THE SMALL INTESTINE

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According to the necropsy reports from a number of clinics in which the examinations have included many thousands of cases, carcinoma of the small intestine comprises about 3 per cent of all the carcinomas of the entire intestinal tract. It is generally noted that carcinoma occurs in the duodenum more often than in the other parts of the small intestines; however, our own records, made up almost altogether from those of patients coming for treatment, show that carcinoma has occurred 24 times in the small intestine as compared with 1,822 times in the large bowel and rectum and 1,689 times in the stomach. This very great difference is certainly striking, and indicates, for some unknown reason, an almost complete minority of carcinomas in this region.

In our series of cases carcinoma occurred 5 times in the duodenum, 11 times in the jejunum and 6 times in the ileum; and in two cases the lesions were multiple and occurred in different parts of the small bowel. In a few instances the neoplasm was close to the juncture of the duodenum and jejunum and it was difficult to establish its exact point of origin; it may have been primary in the third portion of the duodenum or in the first part of the jejunum. It should also be stated that carcinoma in the small intestine varied from the typical carcinoma found elsewhere in the gastro-intestinal tract in that in a number of cases carcinomas developed on polypi or papillomas. In a

few instances only did we observe the true colloid carcinoma, similar to the ordinary intestinal carcinoma occurring in the part of the intestine between the pylorus and the cecum.

CARCINOMA OF THE DUODENUM

A review of the reported cases shows primary carcinoma of the duodenum to be more commonly encountered than carcinoma of the jejunum or the ileum. In our own series of cases, however, this incidence is not borne out, as we have seen but five cases of carcinoma of the duodenum as compared with 11 of the jejunum and six of the ileum. It should be stated, with reference to these cases of carcinoma of the small intestine, that, in some instances, the growth was quite extensive, and it was impossible to be certain of its origin, though in each instance the person making the examination felt sure that the tumor was primarily a tumor of the small intestine. It is not always possible to differentiate a primary carcinoma of the duodenal mucosa and one originating in the bile ducts, ampulla, or the head of the pancreas, especially after the growth has become extensive. These tumors occur strictly in one of three parts of the duodenum: the supra-ampullary, the ampullary, and the infra-ampullary. About 70 per cent of all carcinomas of the duodenum are located at the ampulla, though probably the most interesting cases for consideration are those in which the lesion is in the first part of the duodenum above the ampulla. It is this portion which is so commonly the seat of an ulcer, and it is of considerable interest to compare the tendency of these ulcers to undergo malignant change with the tendency of the gastric ulcer to change in the same way. So far as I know, no one has ever witnessed the change of a benign gastric ulcer into a malignant ulcer, although, from the clinical, surgical, and pathologic evidence

that we have at hand, we are convinced that such a change takes place, at least occasionally. It seems probable that most gastric cancers begin as cancers, but, in some instances, in which an inoperable carcinoma is encountered in a patient who has had an increasing stomach trouble for twenty years or more, it is reasonable to assume that the cancer has not been present all of that time.

In the consideration of the surgical treatment of gastric ulcers, excision should be the accepted treatment, not only for the purpose of obtaining complete relief of symptoms, but also because the ulcers may be malignant at the time, or may later become malignant. We need not have the same fear of malignancy in cases of ulcer of the duodenum. So far as I am able to interpret the case-reports, no clearly defined instances of primary carcinoma of the duodenum which might be mistaken for ulcers, have been reported, and there is very little definite evidence to show that carcinoma of the duodenum ever arises from an ulcer. I was unable to find, in the records of the Clinic, any evidence that a primary carcinoma of the duodenum arose from an ulcer. This point has been considered very carefully and in great detail by others, especially by Jefferson, who collected 30 cases from the literature in which it is possible that this malignant change took place in a duodenal ulcer. However, Jefferson states that he is not at all certain that such changes did take place. He reports a case in which he performed a necropsy two and one-half years after a gastroenterostomy for duodenal ulcer, in which there was no evidence of the original ulcer, but there was a duodenal carcinoma of the constricting type just where the ulcer was reported to have been. This case seems very important as a support to the contention that duodenal ulcer may be the base of a duodenal cancer. Bland Sutton reports an interesting case in which a

duodenal ulcer was the base of a spindle-cell sarcoma. This was the only case of a primary malignancy of the duodenum that he had seen. At the present time the evidence to show that duodenal ulcer ever becomes malignant does not seem sufficient to warrant a consideration of its excision to prevent recurrence. It is possible that such ulcers will be excised oftener in the future, but the question of malignancy need not be taken into account.

In reviewing our records I found five cases which might be considered as primary carcinomas of the duodenum. In one of these cases a gastro-enterostomy was done for an inoperable obstruction. This relieved the patient for a time. At necropsy, several months later, the pathologists reported carcinoma of the duodenum extending up to the pylorus. In the second case there was a carcinoma of the pyloric end of the stomach; and beginning just below the pylorus, independent of the pyloric tumor, was a malignant papilloma of considerable size. In the third case the original tumor was, presumably, of the first portion of the duodenum, though the ampulla was obliterated; and from the extent of the trouble it was difficult to determine at just what point it originated. The fourth case was quite similar to the third, and showed extensive malignancy. In the fifth case there was a large carcinoma originating in the first portion of the duodenum. In addition to these cases, there was one other in which operation was done for obstruction in the jejunum, caused by intussusception produced by a malignant polyp. The necropsy, some time later, revealed a papillary carcinoma of the first part of the duodenum, which apparently had not produced symptoms. The histories of these five duodenal cases indicate that the papillary tumor, which so readily becomes malignant, is one of the most common types of primary carcinoma of the first part of the duodenum.

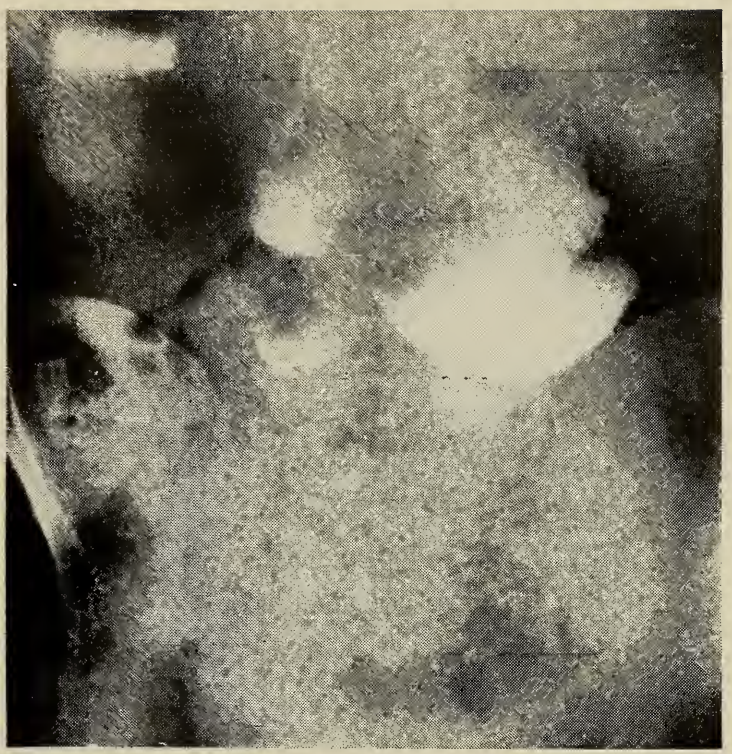

Fig. 1 (86605). Obstruction of the upper jejunum, showing gas and barium in the jejunum at the point of obstruction; six-hour retention in the stomach and duodenum.

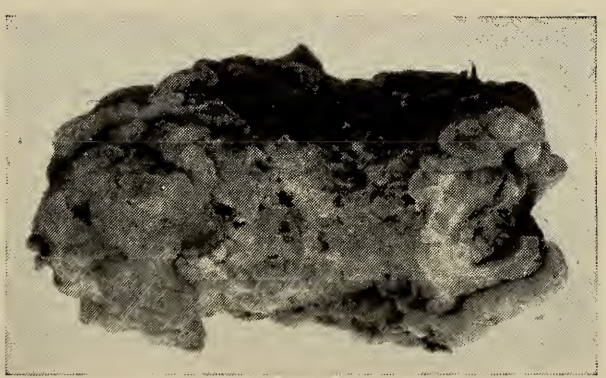

Fig. 2 (86605). Gross specimen.

Fig 3 (85883). Obstruction of the upper small bowel. The markings of the valvulae conniventes are clearly visible in the gas and fluid-distended bowel.

Fig. 4 (189091). Obstruction of the small bowel, showing gas and fluid-distention of the bowel.

Fig. 5 (127339). Small-bowel distention due to low obstruction.

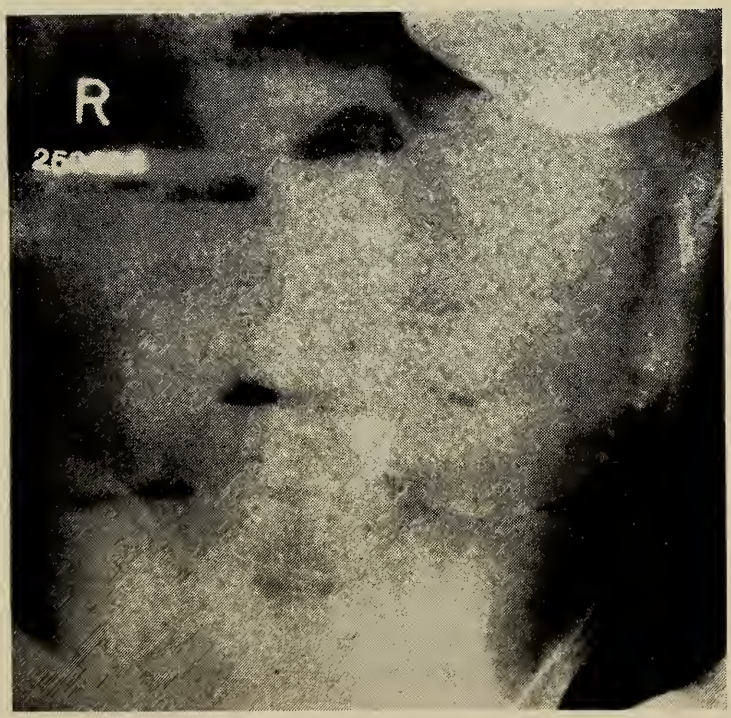

Fig. 6 (250604). Gas-and-fluid distented small bowel due to low obstruction.

It is this type which seems, at times, to extend across the pylorus from the duodenum to the gastric mucosa.

CARCINOMA IN THE REGION OF THE AMPULLA.

The exact point of origin of a carcinoma in the region of the ampulla is frequently difficult to determine. It may originate in the duodenal mucosa, in the mucosa of the ampulla or ducts, or in the head of the pancreas. A primary carcinoma in this region, if it obstructs the biliary and pancreatic ducts, as it usually does, presents the same clinical picture, no matter where the growth originates, namely, painless jaundice and great emaciation. The jaundice gradually increases, and in a short time becomes very deep. The emaciation depends on the extent of pancreatic interference, which is apt to be complete; and the loss of weight and strength is very marked. A carcinoma in the mucous membrane of the ampulla is the most frequent type, and also probably is the most amenable to treatment. It is very probable that these cases, as a group, have not received the consideration in the way of treatment that is warranted. It is apparent that, if the liver and the pancreas have been completely blocked for any length of time, radical surgery cannot be considered, although, I believe, in some instances the cases may be obtained early enough so that a removal of small carcinomas in the region of the ampulla will be possible. Plastic surgery in this region has been very satisfactory in the traumatic and stone cases, and, undoubtedly, is of advantage in malignant lesions that are slow in developing and in forming metastases.

CARCINOMA IN THE INFRA-AMPULLARY PART OF THE DUODENUM

In the infra-ampullary part of the duodenum, a carcinoma occasionally occurs as a primary constrict-

ing lesion. Such cases are often diagnosed as cases of pyloric obstruction, though the clinical features are different in that the patient with duodenal cancer and obstruction usually vomits a large amount of material containing bile and pancreatic secretion. The tumors are usually small, and produce a marked degree of obstruction. If they are not attached posteriorly to the vena cava and other structures they may sometimes be removed satisfactorily. This condition of carcinoma of the third part of the duodenum is suggested when marked dilatation of the duodenum is encountered. The *x*-ray will often locate the obstruction in these cases. In certain instances it might be quite difficult to state whether the tumor is located in the terminal duodenum or at the beginning of the jejunum.

CARCINOMA OF THE JEJUNUM

Carcinoma occurs in the jejunum either as a degenerated polyp or as a ring carcinoma, quite similar to the ring carcinoma frequently seen in the large intestine. In the degenerated polyp type there is usually no evidence of the condition until the tumor has been forced down into the lumen of the bowel so as to produce intussusception and obstruction. These tumors rarely become so large as to interfere with the lumen of the intestine. They may, however, be multiple, as they were in several of our cases. Polypi of the small intestine are not altogether uncommon, and it is well to realize that they may undergo malignant changes. In the ring carcinoma type the onset of the obstruction is gradual; and often the lesion is located with difficulty. The *x*-ray is helpful in these cases. The tumor is small, and is not palpable early in the trouble, although peristaltic waves may be in evidence. On exploration the proximal loop of the intestine will be found greatly dilated, and the wall hypertrophied from the gradually increased exertion. At first ap-

pearance the dilated small intestine resembles the large bowel. Ordinarily, these tumors do not metastasize early; a liver nodule, however, was noted in one of our cases when the intestinal growth was very small. Often the omentum is sealed to the growth. In one instance, because of this omental attachment, I considered a radical excision inadvisable, and made an entero-anastomosis, joining the distended and collapsed bowel. The fact that this patient lived comfortably for eighteen months, indicates, I believe, that it was a mistake not to have excised the growth with the attached part of the omentum. Mikulicz reported one case of a patient living ten years after an anastomosis without excision, which would suggest the condition to have been a benign lesion or a very slowly developing malignancy. Radical excision is certainly indicated unless the disease is extensive or presents distant metastasis. Regional lymphatic enlargement does not contra-indicate radical excision. We have had eleven cases of carcinoma of the jejunum; in most of these a positive diagnosis could not be made before exploration, and in a considerable number the growth was too extensive to permit radical operation.

CARCINOMA OF THE ILEUM

Carcinoma of the ileum, like carcinoma of the jejunum, is of an annular contracting, or ring, type; also as a sprouting polyp or carcinoma, in which case the growth is a broken down papilloma. Occasionally the massive developing type of carcinoma is encountered; in the jejunum and ileum the growth is so large and involves so much of the intestine that it frequently is mistaken for tuberculosis. The lumen is not greatly interfered with by the growth, so that it may be very large and extensive before it is recognized; only one such case is recorded in our series. Comparatively few carcinomas have occurred at the

ileocecal valve. In nearly all of our cases the lesion originated several inches from the valve, and was not associated with it in any way. A number of cases have been reported in the literature in which the growth seemed to arise directly in the mucosa at the juncture of the ileum with the cecum. Other instances have been cited in which a carcinoma, arising from the ileum or the cecum, had extended across the mucosa of the ileocecal valve. We have seen very few carcinomas at the valve as compared with the number arising at the juncture of the cecum with the ascending colon or of the ileum proper. From the mechanical arrangement of this region of the intestine and the likelihood of repeated traumatization, it would seem that carcinoma would not be uncommon in this area.

Cases of multiple tumors in the small intestine have often been reported. In several of our cases the growths were multiple. These may occur as papillary tumors or ring-constricting tumors. In one of our cases there was a tumor in the stomach and one in the small intestine; and in at least two cases there was a tumor in the small intestine and one also in the large bowel. Gruner and Fraser have reported two cases of symptomless tumors occurring in the ileum. The growths arose in the submucosa, and were, histologically, similar to tumors of the appendix as observed by MacCarty. While such neoplasms are histologically malignant, so far as we have observed they never develop to the point of producing symptoms, and have never been known to metastasize. True carcinoma of the appendix is rare in our experience, though this type of hyperplasia occurs in about one in every 250 appendixes examined.

The clinical features in a true carcinoma of the ileum are similar to those of the jejunum. Usually the diagnosis is intestinal obstruction, the location of which must be determined at the time of the opera-

tion. In some instances the *x*-ray will make the location more definite. When a papillary carcinoma is encountered it should be remembered that there may be multiple lesions. As regards treatment, the same observation holds in carcinoma of the ileum and carcinoma of the jejunum; that is, excision should be done if there is no distant metastasis, and if the local attachments are not too extensive. In case of a very marked obstruction with a great deal of intestinal distention and associated fecal vomiting, it will be well to do the operation in two stages, first relieving the obstruction by an enterostomy, and then making a resection. I believe this method of procedure should be followed in every case in which the obstruction is marked. The mortality-rate from operating in cases of acute obstruction is so high that any procedure which will reduce it should be employed. In our series there were six cases of carcinoma of the ileum; four were adenocarcinoma, or the ring type of growth, and one was a degenerating polyp with the resulting intussusception. In one case, inoperable because of the extent of the disease, there was a definite carcinoma in the ileum, high up, and one in the cecum also.

In the present review are 24 cases, which I have been able to collect from the records of the Clinic. The records show also that during the same period there were 1,689 cases of carcinoma of the stomach and 1,822 cases of carcinoma of the large intestine. As compared with 24 cases of carcinoma of the small intestine, this would seem to be a smaller percentage than has been reported in other statistics. This may be due to the fact that in our cases the records are of patients coming for treatment, while in the reported cases, in most instances, the series are of those coming to necropsy.

ABSTRACTS OF REPORTS OF CASES

FIVE CASES OF CARCINOMA OF THE DUODENUM, AVERAGE AGE OF PATIENTS, 53 YEARS

CASE 1 (24217).—A man, aged 57, had had at times a constant, dull, aching epigastric pain through to the back. The patient had not vomited, but had eructated sour gas and sour water constantly, and occasionally sour food. His appetite had been good, but he had become progressively weak since the symptoms began. There were no severe cramps or colics and no weight loss. The test-meal findings were as follows: Total acidity, 94; free hydrochloric acid, 0, and combined, 94; lactic acid, +; blood, +; food remnants, + + + +. There was a nodular tumor, movable on inspiration, in the right epigastrium. The abdominal veins were engorged. The clinical diagnosis was carcinoma of the pylorus.

June 12, 1909, an anterior gastro-enterostomy was done, and a carcinoma of the duodenum, extending up to the pylorus, with obstruction, was found. The patient died September 12, 1909, three months after the operation.

CASE 2 (61097).—A man, aged 39, had had a severe attack of inflammation of the bowels twenty-two years before. For twenty years the patient had had spells of "nervous indigestion," lasting for a week or more. He had had a sensation of weight below the umbilicus immediately after meals, and occasionally sour stomach and some gas. The bowels had always been loose until within the past year, when they were very constipated and symptoms had become more distressing. Gas and vomiting of a sour, undigested mass occurred at first every three to four days, and later was forced every night in order to permit sleep. Gas pain came immediately after meals and other pain came on two hours after meals. The distress was mostly in the lower abdomen, although there was some in the left iliac fossa. There was some distention. There was a loss in weight of forty pounds in six months. The test-meal findings were as follows: Total acidity, 24; free hydrochloric acid, 0; and combined, 24; lactic acid +; blood +; food remnants +. A mass was palpated in the epigastrium. The clinical diagnosis was pyloric obstruction.

Nov. 22, 1911, a Billroth No. 2 and a posterior gastro-enterostomy were done. The duodenum was removed down nearly to the common duct, and a piece of the pancreas was removed for secondary carcinoma. Extensive carcinoma of

the pyloric end of the stomach and primary carcinoma of the duodenum were found. Beginning just below the pylorus, and very adherent to the head of the pancreas, was a malignant papilloma which distended the upper end of the duodenum to the size of an orange. The pathologic findings were: Adenocarcinoma of the stomach and a carcinomatous papilloma springing from the duodenal side of the pyloric ring.

Case 3 (163558). A man, aged 52, six months before began to have cramps in the lower bowels which lasted two hours. A few days previous to examination he had had diarrhea, followed by cramps for three or four days, as many as eight stools a day, slimy, with a sour odor. He had pain in the pit of the stomach one hour after meals, of short duration at first, but which later was constant. He had a ravenous appetite, but had lost 20 pounds in weight since the onset of the trouble. The jaundice, which came on a week before was getting worse and he was emaciated. No test-meal was given. The *x*-ray showed a redundant transverse colon and sigmoid. Physical examination showed a mass to the right of the umbilicus. The clinical diagnosis was made of obstruction of the common duct, carcinoma (?), or pancreatic carcinoma (?).

July 1, 1916, a cholecystogastrostomy and an exploratory choledochotomy were done, and a hard, firm mass at the head of the pancreas, which produced obstruction of the common duct, was revealed. The common duct was opened and the finger introduced in order to make sure that there were no stones. The tumor was found to be the cause of the obstruction. July 6, 1916, a transfusion was done for secondary hemorrhage. Death occurred July 8, 1916. Necropsy revealed a carcinoma of the first portion of the duodenum and head of the pancreas, with obliteration of the ampulla of Vater.

Case 4 (143715).—A man, aged 59, first came for examination, October 19, 1915, complaining of the sudden onset of numbness of the fingers and lower extremities, which had been gradually increasing during the previous ten months. For a year he had had spells of distress in the stomach, the spells coming on two hours after meals and at midnight, and lasting from a week to ten days. Bicarbonate of soda and vomiting afforded relief. He vomited sour material at irregular intervals, often at night; and at times the entire previous meal was vomited up. His appetite was good. The hemo-

globin was 40 per cent. The test-meal findings were as follows: Total acidity, 10; free hydrochloric acid, 0; combined, 10. The *x*-ray findings of the stomach were indeterminate. Secondary anemia and pyorrhea, 2+, were discovered, and treatment was recommended to clean up the mouth from infection. A bland diet was advised. After three and a half months' treatment at the Clinic, followed by treatment at home, the patient returned with all the symptoms aggravated. His appetite had been good as a rule, but he had lost in weight rapidly during the last two months. He had an icterus of seven weeks' standing. The hemoglobin was 22 per cent. A clinical diagnosis of hypertrophic cirrhosis of the liver, ethylism and secondary anemia was made.

July 7, 1916, transfusion for secondary anemia was done. Death occurred July 11, 1916. Necropsy revealed carcinoma of the first portion of the duodenum, common-duct obstruction, general icterus, and a huge right pulmonary embolism.

CASE 5 (207423).—A man, aged 58, came for examination, giving an eight-months' history of daily dull, gnawing epigastric pain without radiation, two to four hours after meals. He had sour and bitter eructations, and vomited from three to nine times a day, often large amounts, with blood and "coffee grounds." The vomiting afforded much relief. The course of the disease was progressive, associated with a marked loss of weight, strength, ambition, endurance, and appetite. He was constipated, but had no severe pain, jaundice, or fever. The test-meal findings were as follows: Total acidity, 30; free hydrochloric acid, 0; and combined, 30. There was a trace of blood, and food remnants, 2. A tender fullness in the right epigastrium was noted, but no mass was palpated. The *x*-ray showed a duodenal ulcer. The clinical diagnosis was pyloric obstruction and carcinoma of the stomach (?) and pancreas (?).

September 15, 1917, a posterior gastro-enterostomy was done, and a pyloric lesion was found, apparently on the duodenal side, which caused obstruction (4). A large mass which felt inflammatory was fixed to the liver and the pancreas. Death occurred September 16, 1917, and necropsy revealed carcinoma of the first portion of the duodenum (embolism?).

SUMMARY OF CASES OF CARCINOMA OF THE DUODENUM

In Case 1 of this group the eructation of food for some months suggested ulcer primarily, although there was no other evidence of ulcer. A tumor mass was palpable, and

was thought to be in the pylorus until the exploratory incision revealed a duodenal carcinoma. The history of the case furnished no indication that an ulcer was present prior to the carcinomatous growth.

In Case 2 the clinical history is not of much importance so far as the duodenal growth is concerned, since the patient also had a carcinoma of the stomach in addition to the papillary carcinoma of the duodenum. However, a history was given of twenty years of stomach trouble, which suggests the existence of a high gastric ulcer prior to the carcinoma.

In Case 3 the lesion occurred in the region of the ampulla and was so extensive that no estimate could be made of its exact origin.

Case 4 was reported as carcinoma of the duodenum. There is nothing in the history to suggest that it had formed on an ulcer.

Case 5 was first diagnosed as duodenal ulcer. The man was 58 years of age, and gave a history of having had trouble for eight months. At operation it was impossible to discover where the tumor originated, though it obstructed the duodenum. The tumor in no manner resembled a duodenal ulcer. The necropsy revealed an inoperable carcinoma, apparently primary in the first portion of the duodenum.

ELEVEN CASES OF CARCINOMA OF THE JEJUNUM. AVERAGE AGE OF PATIENTS, 46 YEARS

CASE 6 (710).—A man, aged 39, for three months before coming for examination had been troubled by gas, rumbling, and sour eructations, and cramping pains in the abdomen starting on the left side below the umbilicus, and going to the right. The patient had taken liquid diet from the beginning, but for the past month everything that was eaten was vomited as sour, undigested food. The bowels were in fair condition; the weight loss was fifty pounds. No abdominal tenderness was detected on examination. A diagnosis of chronic intestinal obstruction was made.

October 12, 1907, a resection of twelve inches of the small intestine and a lateral anastomosis were done. A carcinoma of the jejunum five feet from the origin, with great obstruction, was found. Pathologic examination showed carcinoma of the small intestine. The patient died at his home some time within a year after the operation.

CASE 7 (20434).—A man, aged 40, had had attacks of colicky pain in the lower abdomen, induced by sour food,

for twenty years before coming for examination. Three months before he had had an attack of dull, aching pain in the pit of the stomach, regularly one-half to an hour after meals, followed by occasional heartburn, and vomiting of bitter food, with relief. Recently there had been retention emesis. The appetite was fair; the bowels were very constipated save for one attack of diarrhea five months before. During the past three months he had lost twenty-five pounds. He was emaciated and cachectic. The test-meal findings were as follows: Total acidity, 50; free hydrochloric acid, 24; and combined, 26.

February 27, 1908, an exploratory operation was done, which revealed malignant disease of the jejunum two inches below the duodenal-jejunal juncture. There were secondary nodules in the peritoneum and in the intestines, and free fluid in the abdomen. Pathologic examination of a lymph-gland showed carcinoma.

Case 8 (25214).—An unmarried woman, aged 49, had had curvature of the spine since she was eleven years of age. She gave a history of cough and night sweats for two years. Three months before coming for examination she had had gas on her stomach for three days, with difficulty in expelling it, and a sudden onset of pain in the pit of the stomach that worked down around the umbilicus and up to the costal arch; this lasted one hour. Since that time she had had cramps from fifteen to thirty minutes after meals, lasting an hour, after which there was tenderness over the epigastrium. Occasionally the right costal pain penetrated to the back. There was no nausea or vomiting. The appetite was poor. There was a loss in weight of from ten to twelve pounds. The bowels were constipated; there was black passage, but no blood. A tumor had been noticed two weeks before. A mass was found in the left side of the abdomen, and diagnosis of a tumor of the splenic flexure was made.

July 8, 1909, an exploratory operation was done, and a carcinoma was found beginning at the jejunum, with the involvement running through the mesentery of the small intestines and the region of the superior mesenteric artery. There were movable nodules on the peritoneum. Death occurred at the patient's home, Oct. 18, 1909.

Case 9 (68893).—A married woman, aged 46, three years before coming to the Clinic, had had an onset of short spasms of severe pain, in the epigastrium, extending through to the back. Morphine was given. There was tenderness afterward, but no fever, no bowel disturbances, and no vomiting

until after the use of the morphine. She also had had headache, and more or less dull pain in the right loin. Her appetite was fair. For the past six weeks the epigastric pain had come on for one hour immediately after meals; there was no vomiting. The bowels were constipated. There was anemia with gradual loss of weight of twenty pounds in three years. The test-meal findings were as follows: Total acidity, 48; free hydrochloric acid, 0; and combined, 48. Examination showed a slight fullness in the right hypochondrium and an indefinite cystic left abdominal tumor. A diagnosis of gall-stones and a left abdominal tumor was made.

June 18, 1912, an entero-anastomosis was made just below the obstruction. Carcinoma of the upper jejunum was found about two feet below the origin. The growth involved the entire circumference, and the mesenteric glands, and produced obstruction, which in time produced a tumor the size of a fist along the mesentery and spine. A small nodule removed from the mesentery was shown to be carcinomatous.

Case 10 (85886).—A man, aged 43, nine months before coming to the Clinic had had spells of cramping pain from three to four hours after meals, which was relieved only by induced vomiting. The spells occurred at varying intervals, until five months previously, when the trouble became practically continuous, the pain coming on one and one-half hours after eating, with no relief except from induced vomiting of bile and a quantity of foul material which had been in the stomach several days. The patient had had daily lavage and had been able to keep down only a few liquids. The bowels were regular if anything passed through the stomach. The test-meal findings were as follows: Total acidity, 50; free hydrochloric acid, 40; and combined, 10; Oppler-Boas, 2; food remnants, 2. The *x*-ray examination showed carcinoma of the stomach. A clinical diagnosis of pyloric obstruction and dilated stomach was made.

June 17, 1913, an entero-anastomosis was made, and a ring carcinoma high up in the small intestine and nodules in the omentum, inoperable on account of metastasis in the omentum, was found.

Case 11 (86605).—A man, aged 57, had an onset of trouble with an attack of diarrhea nine months before examination. He vomited, occasionally, a sour, green material from two to three hours after meals, and complained of soreness in the area of the right costal margin and in the epigastrium,

He had avoided acids and meats, and had lost twenty-five pounds in weight and much strength. The bowels were constipated, but there was no melena. The test-meal findings were as follows: Total acidity, 48; free hydrochloric acid, 40; and combined, 8; food remnants, 2; altered blood, 1; sarcines, 3. Physical examination showed cachexia and a movable, tender, right epigastric mass. The *x*-ray showed pyloric or duodenal obstruction. The stomach and duodenum both contained a six-hour residue. A loop of small bowel was caught up behind the stomach and contained residue. A diagnosis of jejuno-duodenal obstruction (ulcer-carcinoma?) was made.

July 2, 1913, a resection of the upper jejunum and an end-to-end anastomosis were made. A jejunostomy five inches below the anastomosis was made for feeding purposes. The operative findings were a spool carcinoma one and one-half inches below the transverse mesentery of the colon and the upper jejunum. An inflammatory gland was removed from the spine. There was a sharp, horny deposit, a spur on the lumbar spine behind the carcinoma. Pathologic examination showed carcinoma of the jejunum.

Case 12 (134048).—A man aged 44, came to the Clinic complaining of the onset, six months before, of a feeling of fullness and weight and distress immediately or soon after meals. This passed away of itself, or after induced vomiting of bile without blood or retained food. The patient had lost forty pounds in weight in the first three months, but not much since that time. For the past two months he had been on light diet, and had rarely vomited. The bowels were very constipated for the previous month or more. The test-meal findings were as follows: Total acidity, 36; free hydrochloric acid, 22; and combined, 14; the food remnants were 1+. Examination revealed a mass just below the umbilicus. The *x*-ray showed a No. 2 residue, a palpable tumor mass, chiefly if not wholly extrinsic, and dilatation of the upper small bowel, evidencing obstruction. A diagnosis of cancer of the colon was made.

June 26, 1915, a resection of one foot of small intestine, including the growth, and an end-to-end anastomosis were made. A primary carcinoma of the small intestine encircling the entire bowel six inches below the duodenum and adherent to the tranverse colon was found; the colon was not involved. Pathologic examination showed extensive carcinoma of the jejunum with no glandular involvement.

Case 13 (151015).—A married woman, aged 34, had had an operation in May, 1915, when eight inches of bowel were removed for inflammation. A button had been used. Two months prior to the operation an abdominal mass had been felt in the right umbilical area. The pain was felt chiefly when the patient was in a reclining position and she was obliged to lie on her right side. Constipation was marked. A good recovery was made from the operation, and she gained eight pounds in weight. Two months later a mass which gradually became larger, was again felt to the left and at the level of the umbilicus. The patient's back ached, she was constipated, and injections gave distress; distention, 2; the patient was anemic and thin. The irregular, firm, movable mass suggested carcinoma. A diagnosis of recurring abdominal tumor was made.

Jan. 29, 1916, a resection of eight feet of intestine with a mass of glands was done, and an end-to-end anastomosis was made. A carcinoma of the upper jejunum about sixteen inches from its origin was found. A large mass of glands extended down on to the superior mesenteric vessels, which were probably cut and tied. The transverse colon was dissected free. The growth and the glands were necrotic, very foul, and adherent to the abdominal wall. The blood-vessels ran into the growth and were considerably choked. Collateral circulation could be obtained. Pathologic examination showed carcinoma of the jejunum.

Case 14 (159902).—A man, aged 45, four weeks before coming to the Clinic had an acute attack of abdominal pain, which localized in the right iliac fossa. The patient had kept at his work, and four days before there had been a very severe exacerbation of pain in the same place, followed by vomiting and, he thinks, fever. A bloody diarrhea and tarry stools and the formation of a mass followed. There was no bowel movement for two days prior to examination. The patient could scarcely walk for pain; he had lost twenty-three pounds in weight. Examination revealed a mass in the right iliac fossa. A diagnosis of appendiceal abscess was made.

May 19, 1916, a resection of twelve inches of the small intestine, and an end-to-end anastomosis were done. The operation revealed carcinoma of the small intestine (about the middle of the jejunum), with extensive glandular involvement, which could not be removed. A resection was done on account of the danger of obstruction, from which the

patient was evidently suffering. The appendix was not diseased, and was not removed.

Case 15 (189091).—A man, aged 65, had had spells of pain lasting from seven to ten days, with intermissions of from one to three weeks. For three months before the pain had been almost constant, except during the last ten days. The pain came on for half an hour soon after eating. There were peristaltic unrest and rumbling, and then ease until food or drink was taken. There were no vomiting and no sour eructations, but some gas and belching. The patient's appetite remained good, but he was afraid to eat and had lived on liquids during the past two months. When the stomach was empty he had no pain. He had lost ninety pounds in weight. The bowels were usually normal; but several times during the previous four months the stools had been liquid, and there were several movements a day. The food remained just as it had been taken into the stomach. On examination for test-meal findings, the stomach was found to be apparently empty. Pressure on the stomach forced forward a large amount of gas and liquid material; there was no mass palpable. The *x*-ray examination showed the stomach and colon to be negative. A diagnosis of chronic intestinal obstruction was made.

April 4, 1917, an entero-anastomosis of a completely distended loop and of a collapsed loop of the small intestine was done. A gland was excised from the mesenteric attachment beneath the growth, and a small gland was excised from just beneath the serous coat. An inoperable ring carcinoma of the small bowel, beginning apparently in the jejunum, was found. The bowel, up to the growth, was markedly dilated, and was almost completely obstructed. Ascites and nodules in the right lobe of the liver which had the characteristic feel of carcinoma, were noted. Pathologic examination of a specimen from the jejunum showed it to be carcinoma.

Case 16 (241941).—A man, aged 47, had had two previous operations, one in February, 1917, for the removal of a growth from the left shoulder, and the other in September, 1917, for the removal of glands from the neck and arms (sarcoma?). Two and one-half months before coming to the Clinic, the patient had noticed an intermittent pain to the left of the umbilicus and a little below, which came on for a few minutes and then disappeared. The pain was not affected by food, as the patient felt well after eating, and

there was very little belching and no nausea or vomiting. He was sometimes wakened at night by pain in his side, but had not been kept awake. Two months before his examination here he had had an acute attack of pain and a physician was called. There was a weight loss of twenty pounds in four months. The patient was put under observation and two weeks later three hours after eating he had an attack of pain, lasting a few seconds, to the left of the umbilicus, and he vomited considerably more than he had eaten for breakfast. This was repeated the following day. The test-meal findings were as follows: Total acidity 36; free hydrochloric acid, 20; and combined, 16. The *x*-ray examinations of the stomach and colon were negative. The diagnosis was indeterminate.

September 9, 1918, a short-circuiting entero-anastomosis around the tumors was done. The operative findings were as follows: Melano-sarcoma (?) or melano-epithelioma (?) of the small intestine secondary to a melano-epithelioma removed from the left shoulder elsewhere. The upper portion of the small intestine was markedly dilated by three tumors involving the mucous membrane of the intestine. The walls of the intestine were adherent to one another, causing obstruction, and were greatly thickened. There were two tumors about three inches apart and eighteen inches below the upper tumor, which was situated in the jejunum, about two feet from its origin. There were numerous large glands in the mesentery. There were a large tumor in each adrenal region, overhanging the kidneys, and a small tumor in the liver. Pathologic examination of the gland showed it to be a melano-epithelioma.

SUMMARY OF CASES OF CARCINOMA OF THE JEJUNUM

Eight of these cases occurred in men and three in women. In most instances, the patients had had symptoms only a few months, in some only a few weeks. In one case, however, some intestinal symptoms had been present for twenty years, and in two cases symptoms had been present for two and three years, respectively. The histories do not show great similarity, and it was almost impossible to diagnose the nature or location of the obstruction, but obstruction was present in every instance. Occasionally the tumors could be felt, although this was not helpful in differentiating. Abdominal pain was severe and colicky, and had occurred intermittently for some weeks. There was no definite localization of the pain, although it was most frequently in one or the other

of the iliac fossæ. Weight loss was very rapid, and in most cases was marked at the time of the examination.

SIX CASES OF CARCINOMA OF THE ILEUM. AVERAGE AGE OF PATIENTS, 50 YEARS

CASE 17 (907).—A man, aged 48, had begun to lose weight twenty-one months before. He had had some pain through the abdomen, colicky but never severe. He had been constipated for a year, and the abdomen had been distended for six weeks previous to an exploratory laparotomy, in which adhesions were found. He gained weight, and had felt well for the next three months, when he again lost weight, and pain and constipation increased. He vomited for two or three days, when there was distention of the lower right side. Examination showed a probable mass in the right hypochondrium, and chronic obstruction (malignant?) was diagnosed clinically.

January 22, 1907, resection of the small intestine and eight inches of ileum was done. Pathologic examination showed adenocarcinoma. The patient died January 30, 1907.

CASE 18 (2263).—A man, aged 53, came for examination, complaining of having had constipation and morning diarrhea for many years. He had also had symptoms of obstruction for the previous six months, that is, gas and distention, and at times a great deal of pain across the abdomen, particularly on the left side. Examination showed an irregular mass in the left hypochondrium. A clinical diagnosis of tumor of the splenic flexure was made.

July 10, 1907, a resection of fourteen inches of the ileum was done for conglomerative tuberculosis and obstruction. Necropsy revealed carcinoma of the small intestine; the glands of the mesentery were involved.

CASE 19 (9420).—A married woman, aged 44, had had attacks of indigestion for ten years, with food distress and gas; vomiting gave relief. For the past year the spells had been worse, with pain in the epigastrium and to the right. Distention, sudden chill, increased pain, black loose stools, vomiting of a green substance, but no blood, had been noted. Morphine had been given for the pain. The last attack continued for two weeks. The patient had lost twenty pounds in weight. The test-meal findings were as follows: First test, total acidity, 14; free hydrochloric acid, 0; combined, 14; and a trace of blood; second test, total acidity, 18; free

hydrochloric acid, 0; combined, 18; a trace of blood; lactic acid?

June 22, 1908, six inches of the ileum were resected. A fibrous polyp the size of an egg was found; it was causing intussusception of the ileum eighteen inches above the ileocecal coil. The pathologic examination showed a malignant polyp of the ileum.

Case 20 (36824).—A single woman, aged 56, had had occasional shooting pains through the lower abdomen seven months before. Four months before the onset she had been distressed with gas three to four hours after meals, and had vomited. Her physician had stated that it was "kidney trouble," and had put her on a milk diet. In four or five days she returned to the ordinary diet because of increased distress from gas and nausea, which continued up to the time of our examination, with frequent spells of vomiting. Her appetite had been good. She had lost eight pounds in weight in four weeks; her bowels were constipated, worse during the last four months, but during this time she had had two attacks of diarrhea, lasting from two to four days. The test-meal findings were as follows: Total acidity, 34; free hydrochloric acid, 26; and combined, 8. An irregular firm mass filling the pelvis and to the left was palpated. There was a small nodule in the vagina. The clinical diagnosis was pelvic tumor (malignant?).

April 27, 1910, the small intestine was resected; fourteen inches of the ileum were removed for carcinoma of the lower ileum; a subtotal abdominal hysterectomy was done; both ovaries and tubes were removed because of secondary carcinoma; and a section of the bladder was also excised because of secondary carcinoma. The pathologic examination showed carcinoma of the uterus, tubes, ovaries and of the intestine. May 1, 1910, the patient died of general peritonitis.

Case 21 (88325).—A man, aged 54, two years before coming for examination had begun to feel as if his stomach were filled with gas immediately after eating. He grew gradually worse but his appetite remained ravenous. As soon as he had eaten the epigastrium became sore and painful. He seldom vomited and never vomited blood; the first time the vomitus consisted of the food eaten the previous day and after that the food eaten several hours before. He had from three to four bowel movements a day, but there was no blood or tarry stools. The test-meal findings were as follows: Total acidity, 8; free hydrochloric acid, 0; combined,

8; food remnants, 1. The *x*-ray showed an hour-glass stomach and obstruction at the pylorus, probably ulcer. Gastric ulcer or probable carcinoma was diagnosed clinically.

July 26, 1913, a lateral entero-anastomosis around the carcinoma was done. The operative findings were as follows: Inoperable carcinoma of the cecum, with secondaries in the omentum, adherent to the posterior outer abdominal wall without obstruction; a carcinoma high up in the ileum, about the middle of the small intestine, with marked obstruction, and a ring carcinoma, probably the primary origin. Death occurred August 5, 1913. Necropsy was refused.

Case 22 (250604).—A man, aged 47, had had, beginning four or five weeks before examination, spells of epigastric fullness with nausea and vomiting of brown, coffee-ground material. There had been a cramp-like mid-abdominal pain, causing the patient to double up, and an unusual rolling of the bowels. The spells came on after a day of constipation and were relieved by enemas. The constipation was followed by an unusual thirst and diarrhea for from one to two days. The patient's appetite had been good between attacks; he had lost thirty-four pounds in weight. The test-meal findings were as follows: Total acidity, 12; free hydrochloric acid, 0; and combined, 12. Examination revealed free fluid in the abdomen and increased peristalsis. No masses were palpated. The left epigastrium was enlarged, but not tender. The *x*-ray examination showed obstruction of the small intestines. A diagnosis of partial intestinal obstruction was made.

November 13, 1918, a resection of about three inches of bowel with the tumor mass was done, and an end-to-end anastomosis was made by splitting the distal ileum about one inch to increase its circumference (C. H. Mayo method). A small ring carcinoma of the ileum was found completely encircling the bowel eighteen inches above the ileocecal valve and forming complete obstruction. The entire small intestine proximal to the growth was enormously distended, very thick walled, injected, and edematous. The carcinoma had perforated through the serosa, but there was no apparent glandular involvement and no metastasis could be made out. There was free fluid in the abdomen. Pathologic examination showed ring carcinoma of the ileum. The patient died November 18, 1918.

SUMMARY OF CASES OF CARCINOMA OF THE ILEUM.

In four of the six cases of carcinoma of the ileum the symptoms were of short duration, being present from one to

twenty-one months. In one case there had been indefinite intestinal symptoms for ten years, and in this particular instance the lesion formed on a degenerating polyp of the ileum. The tumor might have been producing the symptoms all these years. In one case there was a history of diarrhea for two years. The principal lesion was a carcinoma of the cecum, and the tumor in the ileum was not responsible for the symptoms. It was impossible to determine the location of the tumors from the clinical histories and in most instances a general diagnosis of intestinal obstruction was made just as in the cases of tumors of the jejunum.

TWO CASES OF MULTIPLE CARCINOMA OF THE SMALL INTESTINE.

CASE 23 (75198).—A man, aged 68, three months before coming for examination had had an onset of doubling epigastric pain with distention and sourness, after almost every meal. The patient thought that the gas did not pass up or down. When the pain was severe, it went through to the back. For a month he had been eating nothing but koumiss on account of the pain. There was no jaundice or vomiting. The weight loss was thirty pounds. The test-meal findings were as follows: Total acidity, 48; free hydrochloric acid, 0; and combined, 48. Examination revealed a small mass in the right iliac fossa, which was quite movable, also a small mass low in the left epigastrium, and a nodule below the right axilla. Possible carcinoma of the stomach with probable metastasis was diagnosed.

November 12, 1912, an exploratory operation was done. Many large tumors the size of a lemon, encircling the small intestine in different areas, but not narrowing the lumen, were found; there was no obstruction. The glands of the mesentery were involved, and there was free fluid in the abdomen. One large mass was found in the pelvis. The condition did not appear characteristically malignant. Pathologic examination of a gland from the mesentery showed carcinoma. Death from pulmonary embolism occurred November 24, 1912.

CASE 24 (145438).—A married woman, aged 56, came to the Clinic, vomiting. The husband stated that the vomiting had persisted for the previous two and one-half months, and at the onset had contained much bile. The patient had no appetite, and she experienced a great deal of abdominal pain. The bowel movement was somewhat difficult. She was able to drink water, and thinks that this had "preserved" her. She had eructations and some gas. Lying on the right side seemed to relieve the vomiting. Examination showed marked

emaciation, nausea and retching, and a suggestion of a mass or fullness in the right abdomen. A diagnosis was made of gastric obstruction (carcinoma?).

November 15, 1915, resection was done of three feet of bowel, beginning three and one-third feet below the jejunum. A side-to-side anastomosis was made. The operative findings were a broad-based, pedunculated, cauliflower-like carcinoma of the jejunum about four to five feet from the origin, with intussusception of three feet of bowel. The exploration of the stomach and the duodenum was negative. The common duct was greatly distended. The pelvis and appendix were not examined. Pathologic examination showed a broad based, pedunculated carcinoma, with extension through to the serosa. Death occurred November 16, 1915, and necropsy revealed a papillary cystadenoma of the jejunum (removed at operation), a papillary cystadenoma of the duodenum, cirrhosis of the liver, cholangitis, and chronic cholecystitis (strawberry type) with papilloma. There was no metastasis.

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DISCUSSION

Dr. Arthur Dean Bevan (Chicago, Ill.): Mr. Chairman: I was very much interested in Dr. Judd's paper, and I think it opens up a rather unusual field, but a field that is nevertheless exceedingly important. The experience in our own service has been very much the same as in the larger service at the Mayo Clinic. We have had no case of primary carcinoma of the duodenum which we have recognized as such and operated on, except several cases of primary carcinoma of the ampulla. We have, however, had a number of cases of primary carcinoma of the small intestine; that is, in the upper jejunum, and they have presented some very interesting problems, from both the standpoint of diagnosis and the standpoint of therapy. The condition of carcinoma of the small intestine high up gives much the same picture as a pyloric obstruction, but some points are very different. Dr. Judd mentioned one of these

points which has impressed us in many cases, and that is the vomiting of a large amount of material, not only the accumulation of material in the stomach, but in the entire jejunal loop. And another thing is attacks of partial obstruction, very much resembling the partial obstructions that one has in the large intestine which have been temporary and recovered from, but which have been fairly acute.

In connection with the diagnosis, as Dr. Judd showed you in the very excellent *x*-ray, one can make the diagnosis with much more certainty by means of the *x*-ray than in any other way. The diagnosis of the dilated small intestine is very different from the dilated large intestine, and all the large loops or pockets in the large intestine are quite different from those linear, pearly infiltrations found in the loops of small intestine.

One word in regard to the therapy that has impressed itself upon us very much, and it is this: We have given up the idea of making an end-to-end anastomosis in these cases. I speak very feelingly on this point. I think a lateral anastomosis is much safer for the patient in these cases of carcinoma of the small bowel,—so much safer that we do not hesitate, even in cases of pretty definite obstruction, to do a lateral anastomosis, where we crush the intestine and evaginate that, including a large section, at least an inch, in our first invagination with our first suture, and make a closure with catgut and then follow just the same procedure as in gastro-enterostomy.

We have met with the obstruction in the jejunum and duodenum several times. In one of the cases we failed absolutely to make a diagnosis even at the operation. I operated on a case of my colleague's, Dr. Sippy, with definite indication of obstruction at some point, and we examined every point except the junction of the jejunum and duodenum. Another operation was necessary within ten days, and then we had the good sense to make an examination at that point, and were able to make a lateral anastomosis. In another case we had to make a gastro-enterostomy. We have watched that case for a number of months, and it has been very interesting. We have thrown the whole jejunum into the stomach in the sense that it functionates as the stomach. It does very well if the patient washes out his stomach twice a day. He is in very good condition, has gained in weight, and has no trouble if he washes it out twice a day.

One other point which Dr. Judd did not mention, and I think properly so, as it did not come within the title of his paper. That is the occurrence of malignant disease within

the small intestine. We have run across several times the lymphosarcomas, and they are interesting from this standpoint—they are the only tumor within the small intestine which gives us a bigger caliber than the normal intestine. The cases we have seen have not been associated with obstruction at all, but with blood in the stools, and there has been a definite, palpable mass. I think there is a fairly good prognosis if they are early encountered, but on account of their silent course they are usually diagnosed rather late. My impression is that carcinoma of the small intestine, when early diagnosed, from our limited experience, gives a favorable prognosis. We have several patients who have been well for a number of years after circular resection for carcinoma of the small intestine.

Dr. E. S. Judd (closing): Mr. Chairman: There is nothing that I care to add, but I wish to thank Doctor Bevan for his discussion.

VAGINAL HERNIA

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MINNEAPOLIS, MINNESOTA

Judging from the very few cases reported, vaginal hernia must be of extremely rare occurrence, and for this reason I wish to put on record as of interest the following case:

Miss Emma B., aged 21 years, white, single, waitress, was admitted to the Minneapolis City Hospital, on September 27, 1915. Her only complaint was the presence of a swelling, which protruded from the posterior wall of the vagina at the perineal junction when she stood or strained, but which almost disappeared when lying down and relaxed. It interfered with her working, and, although it was painful, she had suffered no severe sudden attacks of pain. It was first noticed one year before while she was still in bed convalescing from a severe attack of typhoid fever; and since that time it had gradually increased in size.

Aside from this attack of typhoid fever the only other factor in her history which might have a bearing on the etiology of the lesion was that, two years ago she had had both fallopian tubes and appendix removed, probably for pyosalpinx. Whether vaginal drainage was employed is unknown.

Menstruation began at ten years of age, was irregular, but without pain, usually lasted four or five days, and the last period was two weeks before admission. She had never been pregnant.

There was nothing of significance in her family history.

Physical Examination—She was a well-nourished and rather stout girl with well-developed muscles. The abdominal wall was firm, and presented a linear suprapubic scar five inches long in the middle line which was firmly healed and showed no hernial protrusion. There were no tenderness or rigidity and no evidence of tumor.

The vaginal orifice was very much relaxed, and, upon straining and especially when in the upright position, the posterior wall projected through it in the middle line to the size of a small orange, exactly simulating a large rectocele; the perineum, however, was intact. (Fig. 1.) The rectum itself was not examined until the time of operation. When she lay on her back and ceased straining, the swelling became small and almost disappeared. Examination of the pelvic cavity, per vaginam, showed the uterus in normal position and not prolapsed, the cervix small, and the os virginal. There was no cystocele, and the adnexa were not palpable. There was no tumor to be felt in the pelvis.

A provisional diagnosis was made of rectocele.

Operation October 2, 1915.—Under anesthesia, examination of the rectum revealed the fact that it was not prolapsed at all into the apparent rectocele, and took no part in the formation of the swelling.

A transverse incision was made at the mucocutaneous junction of the perineum, and a vertical median one up the posterior wall of the vagina, and the flaps dissected back. The tumor wall, which was later found to be peritoneum, was very thin, and was easily separated from the anterior rectal wall. The dissection was carried up to the level of the recto-uterine pouch behind the cervix. The sac was then opened and a large amount of yellowish fluid drained off, estimated at about a pint. No bowel coils appeared.

Not being able to make out what the conditions were which we were encountering, the lower field was abandoned at this point, and the abdomen opened above the pubes. The omentum was found firmly attached to the uterus and broad ligaments. The tubes were absent. The ovaries were small and full of small cysts. When the omentum was detached and the coils of bowel separated, and the uterus drawn forward, an opening was discovered in the center of Douglas' pouch, about one inch in diameter, through which the finger could have passed into the cyst below. There was no cyst wall above. The opening was closed by sutures including the sacro-uterine ligaments. The abdomen was closed without drain. Returning to the vagina the sac was twisted into a cord, tied and cut off, and the levator muscles sutured over the stump. The redundant vaginal wall was excised and the edges sutured.

Fig. 2 is a sagittal view, showing the hernial sac as it dissected the rectovaginal wall and projected from the vulva.

Fig. 3 is a view from above, showing the opening from

Fig. 1.

Fig. 2.

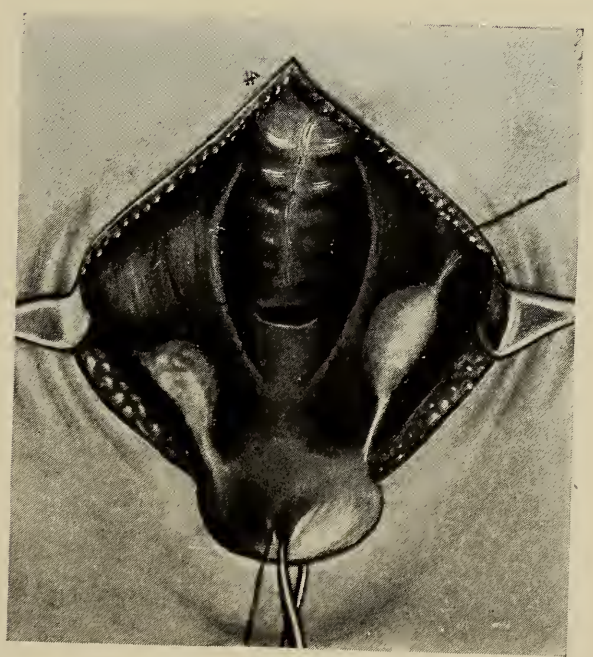

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Fig. 3. (a) Uterus drawn forward; (b) hernial opening.

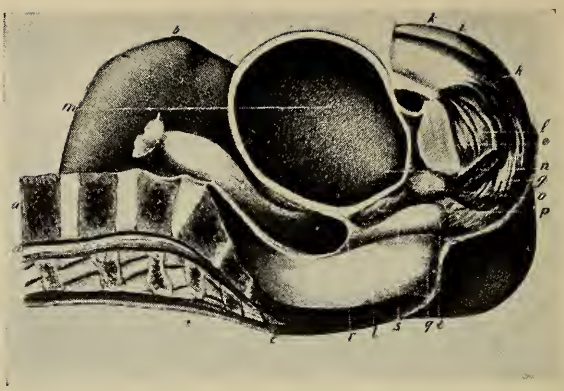

Fig. 4. Astley Cooper's "hernia," 1804.

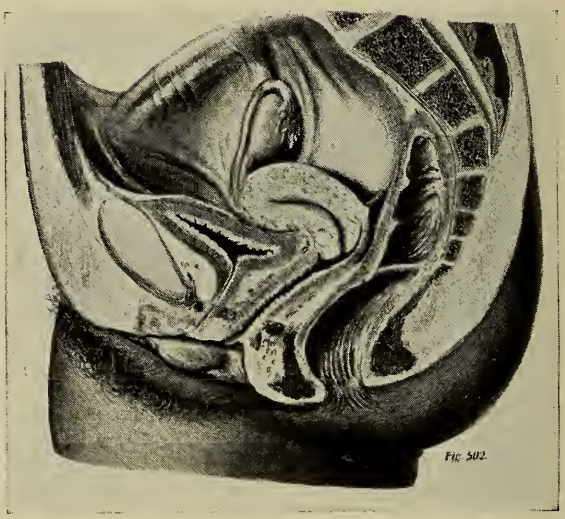

Fig. 5. Sabotta's anatomy.

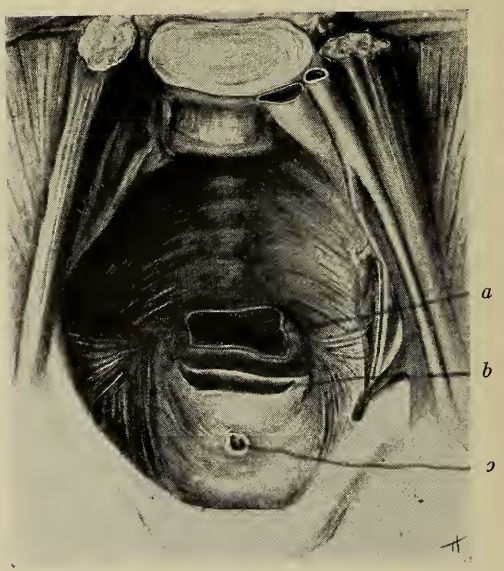

Fig. 6. Dissection by Dr. L. A. Calkins. (a) Rectal opening; (b) vaginal opening; (c) urethral opening.

the cul-de-sac into the hernial sac—closed by sutures at operation.

The patient left the hospital three weeks later, with the parts firmly healed. I have tried to trace her in order to report her present condition, but have not succeeded.

In seeking for an explanation of the conditions found, namely, a hernial sac containing fluid, but no intestine or other viscera, my theory is, that at the operation for removal of the tubes the fibrous floor of the cul-de-sac was injured, and that at the same time there had developed a pelvic peritonitis, which formed adhesions between the coils of bowel and the omentum, creating an encysted collection of fluid at the bottom of the cul-de-sac, the pressure of which caused a pouching downward of the peritoneum; and that a year later, when she suffered the severe attack of typhoid, the tissues relaxed and allowed a protrusion of the hernial sac, into which the bowel could not enter because of the adhesions which held them up. Possibly a better and more probable explanation is to assume that the supposed typhoid fever attack was not typhoid at all, but rather a severe pelvic peritonitis, which caused the encysted fluid to increase in quantity and in pressure, and that in this way the hernia developed rapidly and travelled along the rectovaginal plane, appearing at the perineum.

Very few cases of true vaginal hernia have been reported, and fewer still have been operated on or come to dissection post mortem. Barker states that no case was recorded in the first sixteen volumes of the Transactions of the London Obstetrical Society. Most of the works on gynecology do not mention it at all; a few give it very scant notice under the heading of pudendal and perineal hernia. Even works on hernia pass it by with very little comment. A search of the Index of the Surgeon General's Office brings to light only a few articles, and these refer, more or less, to the same cases. It is difficult, therefore, to get a

true idea of the pathology and pathogenesis and of the proper course to pursue when dealing with them.

Sir Astley Cooper, in his classic work on hernia, published in 1804, reproduces a very clear and distinctive drawing which he made from a post-mortem specimen from a male subject. The course of the sac along the anterior rectal plane and its appearance in the perineum are so exactly similar to my case, making allowance for anatomical difference of sex, that I have taken the liberty of reproducing it. There is no history attached, the specimen having been found accidentally in the dissecting room. Fig. 4 is reproduced from Cooper's work on hernia, 1804, and Fig. 5 is reproduced from Sabotta, showing the normal female sagittal section of the pelvis.

Fordyce Barker, in an exhaustive article written in 1876, reported four cases, none fatal and none requiring operation.

Gaillard Thomas, in 1885, in the course of an extensive paper, reports and illustrates a case of vaginal enterocele, in which he opened the abdomen, caught the bottom of the sac with a long forceps, inverted it, and sewed it to the anterior abdominal wall, and succeeded in curing his patient.

In recent years the only case I have been able to find is one reported by H. Hartman, in 1916, in a French journal (Ann. de gynéc. et d'obst), and abstracted in Surg. Gyn. & Obs. of May, 1917. In his case the sac projected from the posterior wall of the vagina, but did not reach to the vulva. He operated entirely from below, excising the sac at the level of the uterine neck, and suturing the muscular floor below the stump. His patient had been operated on several times before for supposed prolapse, always with the return of the tumor, and he makes the statement that it is necessary, to prevent recurrence, that

the sac must be excised and the vaginal wall reconstructed.

At first thought one would assume that the floor of the pelvis ought to be the favorite site for the occurrence of hernia, for the reasons that it lies at the bottom of the abdominal cavity where the intraabdominal pressure is presumably greatest, is perforated by many small openings for the passage of blood-vessels and nerves, and by the large openings for the urethra, vagina, and rectum, and presents, not infrequently, defects in the muscular floor, as pointed out by Ebner (25 in 60 cases examined). It therefore appears quite remarkable that so few cases are on record. The explanation is twofold, as pointed out by Sir Astley Cooper and Aston Key, many years ago: (1) the obliquity of the pelvic cavity is such that the intra-abdominal pressure is deflected from it, and expended largely on the pubic bone and the anterior abdominal wall in the lower iliac regions; and (2) the pelvic floor is protected by the very strong pelvic and recto-vesical fasciæ, the fibers of which are intimately interwoven with the walls of the canals which pass through it. To illustrate this I wish to show a drawing from a beautiful recent dissection by Dr. L. A. Calkins, of the Minnesota University Medical College. The peritoneum, together with the pelvic viscera, has been removed in one piece, leaving the fascial and muscular layers through which project the terminations of the rectum, vagina, and urethra. This forms a very strong floor covering in the pelvic outlet. (Fig. b.)

Hernias, appearing in the vagina may find an exit in front of or behind the broad ligament. Those in front descend between the ligament and the bladder, and push forward the anterior wall of the vagina, usually to one or the other side. Those behind usually perforate some part of the levator ani or coccygeus

muscles or the interval between them, and push the posterior wall of the vagina forward and, as a rule, laterally, and appear in the upper part of the vagina or, if they come low, in the perineum on either side. Apparently very few go through the pouch in the center, dissecting the rectovaginal septum, pushing forward the posterior vaginal wall, and appearing in the center of the perineum, as in the case here presented.

As regards diagnosis: These hernias have been mistaken for prolapse, for vaginal cyst, and for abscess; and several have been operated on under such mistaken diagnosis, the gut being incised and even excised with fatal results. It is, therefore, well to bear in mind that such hernias do occasionally occur, and have to be reckoned with.

As regards treatment: It seems to me that operation is clearly indicated, both because of the danger of strangulation and the interference with the delivery of a possible future child. The form that operation shall take will depend on the individual case. In some operation may be completed with perfect satisfaction from below, as was carried out by Hartman, but there is no question that cases will present in which it will be necessary to open the abdomen to get the best results, or where, as in my case, the exact pathology is uncertain.

DISCUSSION

Dr. W. H. Magie (Duluth, Minn.): I have recently seen a similar case to the one reported by Dr. Sweetser. About three or four weeks ago, a patient came to my office, and on examination I found a tumor that was evidently a hernia, which projected from the right lateral and anterior wall of the vagina. It was rather elongated, probably two and a half or three inches in length and was easily reduced and gave all the appearances of a hernia. I thought the patient would return later on for further examination and operation.

Dr. Henry T. Byford (Chicago, Ill.): The author of the paper states that he has brought this subject before the Association because of the rarity of vaginal hernia. His

case was apparently one of inflammatory exudate with development below it, and was not related to intra-abdominal pressure. The reason why vaginal hernia so seldom occurs is not so much because the intra-abdominal pressure is reflected backward toward the hollow of the sacrum, for, if you have weakened parts to deal with, you have the whole thing coming out the same as if the pressure were direct. I think it is the connective tissue attachments about the cervix and rectum that really prevent posterior hernia, and the last picture exhibited shows it very plainly. The cervix is normally held back, and the abdominal pressure can only act upon the rectovaginal connection by way of the cul-de-sac of Douglas, namely, in the direction of their long axis, and that is the reason why it seldom occurs. Of course this is quite different from the dragging of the vagina away from the rectum by the prolapsed uterus, acting in the direction of their long axes, when the relaxation of the tissues is only sufficient for retroversion to result. The fundus also has some effect in preventing hernia through the cul-de-sac by acting as a sort of plug.

Dr. Arnold Schwyzer (St. Paul, Minn.): As long as Dr. Byford has started a discussion of the explanation of the vaginal hernia in the case that has been reported by Dr. Sweetser, I would like to say a word or two on the subject. It appears to me we have a bulging downward in this case because we had in a separate walled off pocket a peritoneal exudate.

The case reported reminds me of one that I operated on about twenty-five years ago for a papillomatous tumor. Both ovaries had very large pedunculated papillary growths. From this the patient remained well during all this time. We had taken away both ovaries, and after about eighteen years, say seven years ago, she came with a large bulging mass in the posterior wall of the vagina. The patient was very much opposed to any abdominal operation. The mass fluctuated. We removed about a pint of fluid that contained a good deal of cholesterin, and, in making an examination, it was found that it apparently started in the uppermost part of the rectovaginal septum or at the lowest point of Douglas' pouch. But because it was sealed and fixed firmly above, it was forced down behind the uterus. We only drained, and after about a year she again had a gathering. We drained it again, and left it open for a while, and she has not had any trouble since. She has only a thickening there. I was at a loss to explain that case to myself, and I wondered whether we did not have some cystic formation from a remnant of the Wolffian

duct (from Gartner's canal) somewhere in the uppermost part of the posterior wall of the vagina. Here you have a walling off above so that the cyst was forced downward.

Dr. O. C. Morrison (Carroll, Iowa): I do not know of anything that bothers a practitioner any more than a case of prolapse of the uterus. I am sorry I did not hear the paper, but there is one method we have used in our hospital a great deal during the last five years in the repair of these cases. Prolapse of the uterus in older women is one of the most perplexing things in which to get a perfect repair. I visited the Mayo Clinic not long ago, and while there I inquired about cases of prolapse of the uterus in primiparæ, and the operator told me that he did not recall having encountered any cases excepting those that had traumatism. The idea we have had in mind in operating, has been to use the pelvic fascia as a support for the bottom of the abdomen. The cervix is anchored right in the pelvic fascia, and it acts as an axis of rotation for the uterus. The fundus may fall backwards, forwards, or to either side, but it does not go through. In working this out, if we make use of the pelvic fascia on each side, and there is cystocele we go through the mucosa and submucosa and the tissues, and with a blunt forceps or scissors dissect the bladder away. It is easy to pick up the pelvic fascia on either side, and allow the patient to strain and cough before repairing the bladder. We repair the peritoneum posteriorly.

In the older type of cases, where we shorten the broad ligaments, we have not had in the last five years any recurrence of prolapse, and these patients have been very comfortable.

We have operated on patients of all ages, from the beginning of child-bearing up to seventy years of age.

I remember one case distinctly, a women seventy-eight years of age, who had a complete prolapse of the uterus; by repairing the pelvic fascia in front and the peritoneum, she has been comfortable two years without any inconvenience.

I saw one case on which a good man operated a third time to keep the cervix from prolapsing after a hysterectomy. I suggested to him the plan I have described, and he has been doing it ever since.

ARE WE JUSTIFIED IN REMOVING A COMPARATIVELY HEALTHY GALL-BLADDER?

W. H. Magie, M.D., F.A.C.S.

DULUTH, MINNESOTA

This brief paper is based upon my personal experience in 300 operations upon the gall-bladder and bile-ducts.

There has been, and still is, quite an animated discussion going on as to the relative value of cholecystostomy and cholecystectomy. There is no doubt that each of these methods of securing the same result has its advantages in properly selected cases. While looking over the literature of surgery of the gall-bladder, one is impressed with the wide difference of opinion existing among different authors. There is no department of surgery in which there is a greater difference of opinion than in surgery of the gall-bladder.

My object in presenting this paper is to make a plea in favor of saving the gall-bladder, in, at least, a majority of the cases. The physiologists, as well as surgeons, are of the opinion that the gall-bladder has a function, and, when we admit it has a function, we are compelled to admit that such function, whatever it may be, should be conserved. It is claimed that its chief function is the storage of bile, and that the bile, while in the gall-bladder, undergoes certain chemical changes that better fit it to participate in the processes of digestion, and that this bile is discharged,

at certain intervals, into the duodenum. These intervals correspond with the early stages of digestion. Again, there is another theory, more recently put forward, concerning an additional function of the gall-bladder, namely, that it acts as a pressure-gauge, keeping up the intrabiliary pressure. That the gall-bladder has a function of storing bile there can be no doubt. I have never seen an empty or collapsed gall-bladder when examining it during the course of operations in the upper abdomen. The fact that it is always filled with bile goes to prove that it has much to do with keeping up and regulating the pressure in the bile-ducts and liver. This theory is supported by the results of experiments upon animals. Eisendrath and others have shown that when the gall-bladder is removed in dogs the remaining cystic duct dilates, as do the common and hepatic ducts. The dilatation of the cystic ducts takes on the appearance of nature making an effort to reproduce the gall-bladder. This same dilatation of the cystic duct has been observed in man after cholecystectomy. This effort of Nature to reproduce the gall-bladder is evidence that the gall-bladder not only has the function of storing bile, but also has a pressure-regulation function upon the biliary system. These facts should be taken into consideration where the question of cholecystectomy *vs.* cholecystostomy is to be decided.

Some years ago, while discussing the relative merits of cholecystectomy and cholecystostomy with one of the most popular surgeons of this country, he made the statement that "every gall-bladder that can be saved should be saved; that removing the gall-bladder is like burning the bridges behind an advancing army; that it is valuable for drainage purposes, especially in cases of cholecystitis accompanied by choleangitis with swelling and plugging of the hepatic ducts, as well as the common and cystic ducts, with tarry bile."

Two years ago, while visiting this surgeon at his clinic, I saw him remove what looked to me very much like a normal gall-bladder. In reply to my question as to what percentage of gall-bladders he removed, he stated, "About 97 per cent." This answer was a very unexpected one, although I knew that his mind had greatly changed during the intervening years. The more we study statistics of gall-bladder surgery, the more confused we become, due to the fact that there is a wide difference in results even among the very best surgeons in our country, as well as among surgeons of the countries across the Atlantic. To account for this wide difference of opinion is impossible. How can we reconcile these widely divergent results? Probably as in the case of the surgeon who informs me that he had to re-operate in about one-third of his cases in which he had done cholecystostomies. He left many gall-bladders that should have been removed at the first operation.

The first object we wish to obtain in many of these cases is the saving of human life, for many of these cases are very seriously ill when they reach the surgeon's hands. When to operate in many cases is a very important question, and the outcome will depend on a decision as to the most opportune time for operation. An inopportune time for operation may account for the great difference in the percentage of mortality reported by different surgeons.

One of the most remarkable things I have observed is the great recuperative power the gall-bladder possesses. In my early experience, before we were removing as many gall-bladders as we do now, we were astonished to see a great majority of our patients with empyemic gall-bladders get well, and stay well, after drainage. If such results can be obtained from empyemic gall-bladders, we surely can

expect a mildly diseased one to recover and become again a functioning organ.

It is generally conceded that cholecystectomy has much greater mortality than cholecystostomy. If so, then this consideration also should bear weight in making up our decision. Personally, I have had no mortality in my cholecystostomies, while, on the other hand, my mortality following cholecystectomy has been about the average mortality, if not greater than that of other surgeons.

Recognizing the fact that the gall-bladder is not a vital organ and that man seems to get along very well without it, it still may be true that our patient does not get along so well without it as if he had it still functionating. Owing to the great difficulty in following up our cases, this question is often a very hard one to decide. The facts are, that we have no means of knowing how much better off a patient might have been, if the gall-bladder had not been removed. Again, as to the morbidity following cholecystostomy, we also encounter a wide difference of opinion. One surgeon makes a statement that "fully one-third of his cases treated by cholecystostomy had to be re-operated on; others have put the percentage of re-operated cases as low as five per cent. In my own experience, my cholecystostomy cases have not required re-operating in more than five per cent, and in every case where re-operation was necessary it was on account of overlooked stones or stricture of the cystic duct. In case of overlooked stones, the gall-bladder was simply re-opened, and stones removed and drained as before. In case of cystic duct obstruction, either an anastomosis with the duodenum was made or the gall-bladder removed.

I am of the opinion that long-continued drainage, followed by daily irrigation of the gall-bladder after the removal of drainage-tube, contributes greatly to

the thorough and complete cure of the pathological condition. Irrigation is also desirable for the purpose of washing out any overlooked stones that may have been left. I have, on several occasions, washed out, or at least have had stones as large as a good-sized marble, present themselves at the gall-bladder sinus, when they were easily removed. That drainage also has a good effect in cases complicated with cholangitis, when the ducts are clogged with thick, tarry bile, there can be no doubt.

What are the indications for cholecystostomy? In the writer's experience acute cholecystitis in all cases of only a few days duration; also acute cholecystitis in some cases where there have been previous attacks, provided the gall-bladder walls are not much thickened and are free from adhesions that indicate previous serious attacks, provided, also, that the cystic duct is open and the gall-bladder contains bile are such indications. Many acute gall-bladders contain but little bile at operation, due to swelling of the cystic duct, but within a day or two after drainage is established and sufficient time has elapsed for the swelling to have been reduced, the bile escapes freely through the drainage-tube.

All cases of simple cholelithiasis, when the gall-bladder shows few signs of ever having been infected and when exploration of the interior shows a comparatively healthy mucous membrane, are cases for cholecystostomy.

When should cholecystectomy be resorted to? First, in all cases of hydrops with stricture of the cystic duct; second, in many cases of acute gangrene, or threatened gangrene, of the gall-bladder; third, in all cases complicated with imbedded stones in the cystic duct with ulceration produced by contact with the imbedded stone which, when healed, would probably

cause stricture; fourth, in all very thick walled gall-bladders due to fibrous or calcareous degeneration; fifth, in all cases of ulceration due to pressure of large stones; sixth, in cancer of the gall-bladder where the disease is limited to the gall-bladder.

FOR DISCUSSION SEE PAGE 211

WHAT CONSTITUTES A GOOD RESULT IN GALL-BLADDER SURGERY?

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OMAHA, NEBRASKA

It is not the purpose of this paper to quote statistics. My efforts will be confined to a discussion of the factors which tend to bring about a good result in gall-bladder disease and to point out some of the conditions that make for undesirable results.

The problem resembles somewhat that of a plumber who sets out to do a job that will be sanitarily perfect. His problem is simple because he is dealing with inanimate material. Plumbing of the liver is handicapped by certain physiological processes which have been pathologically changed so much that they no longer work smoothly. The pipes and connections have been so twisted and warped that their normal function is no longer possible. Devices must be made use of, as far as possible, to secure normal function through the intelligent use of inadequate machinery.

Long-continued disease of the biliary tract is apt to produce permanent changes. The mucous membrane often is destroyed over greater or lesser areas; and scar tissue, which distorts the previously smooth surface, takes its place. If the ulceration is in a duct the lumen becomes narrowed, as well as deformed; and this impedes the normally smooth biliary current. If the narrowing is considerable it requires increased pressure to keep the bile moving; and this constant, increased pressure finally results in dilatations and

sacculations back of the narrowed segment. This leads to stagnation, which invites infection; and in this condition the tissues have subnormal powers to resist and overcome the infection. The infection is not confined to the gall-bladder and the larger ducts, but advances into the smaller ducts of the liver.

Infections of the gall-bladder almost always involve, not only the mucous membrane, but the submucous and muscular coats. This produces at first a general or localized thickening of the wall, due to round-celled infiltration and edema. Later, there is usually a thinning and fibrosis with loss of elasticity and contractile power. Now we have a lifeless sac possessing no power to expel its contents when before we had a live and functionating viscus.

The same process sometimes occurs in the common and hepatic ducts. With the elasticity and power of contraction gone, the bile flows through a tube which might as well be made of *papier mâché* so far as its value in accelerating the current is concerned. If it were not for the accessory aids to the transportation of the bile to the duodenum, the results of the pathological changes described would be much more serious than they are. The rhythmical contraction of the diaphragm squeezing the gall-bladder and ducts between the liver and the intestines, and the additional help from the contraction of the abdominal muscles in respiration, continue the flow of bile which might otherwise cease entirely.

In order that the hepatic functions may go along normally, the delivery of the bile into the duodenum must be free and unimpeded. The most ideal conditions for the carrying out of nature's function are a smooth, adequate lumen of the hepatic and common ducts with normally elastic walls, a gall-bladder with healthy mucous membrane, and a normal wall capable of contracting regularly during the digestive process

and free of adhesions; also an adequate cystic duct.

With these fundamental facts in mind when one approaches the question of dealing surgically with this delicate and intricate mechanism, one is stirred by a sense of grave responsibility. In the first work in this field the surgeon's chief aim was to save life. Surgery of the biliary tract has now reached a sufficient state of advancement that his aim is to save life in such a state of health that the future comfort of the patient is reasonably assured.

In a fairly large proportion of the patients operated on such a result is now obtained. The following, I believe, are the most frequent causes of lack of complete relief: (1) impediments, as the result of strictures, torsions, and lessened elasticity of the common or hepatic ducts to the free passage of the bile to the duodenum; (2) lack of elasticity and contractility of the gall-bladder wall, resulting in stagnation of the bile in that viscus and continuous infection and a tendency for re-infections; (3) adhesions of the gall-bladder to the pylorus, transverse colon, omentum, and liver; (4) stricture or kink of the cystic duct.

The avoidance of post-operative distress in all cases is more than one can reasonably expect. The amount of pathology present before the operation may be too great to permit complete restoration of function, but I believe care and skill will count a great deal in preventing or mitigating post-operative symptoms. The less pathology in the biliary tract previous to the operation the better chance the surgeon will have to restore completely the function of the tract. On the contrary, advanced pathology will often defeat his most skilled efforts. The truth of this statement adds emphasis to the plea that operations should be done before the pathology is so far advanced that restoration of normal function is doubtful.

In the earlier work on the gall-bladder and ducts post-operative pain, distress, and invalidism were so frequent that the thoughtful surgeon was led to review his methods and to try to find out wherein his technic had been at fault. That something was wrong we all realized. The brilliant results with complete relief of all the pre-operative symptoms were in too small a proportion to the many cases that were uncured, many of them with no mitigation of the old symptoms and some with new kinds of distress to torment them.

One of my first lessons was in cases in which operation was done for uncomplicated gall-stones with no adhesions. Some of these patients came back later complaining of attacks similar to those before the operation, usually not so intense, but more frequent and, as a rule, with the added statement that before the operation complete relief of the symptoms was experienced between the attacks, but now some pain and tenderness are almost constant. To put the case bluntly, I was not curing these patients; and to convince myself that any improvement had been made required a heroic use of the imagination. Something was obviously wrong with our methods. In some of these cases the abdomen was re-opened under the impression that more stones had formed. This was practically never found to be the case. What we did find was a mass of adhesions between the gall-bladder and the omentum, pylorus, duodenum, and transverse colon, with part or all of these structures adherent to the anterior abdominal wall. Obviously, it was necessary to revise the technic. The delicate peritoneum in this region must be treated with respect. More careful handling and less exposure resulted in some improvement in results.

When the now obsolete method of attaching the fundus of the gall-bladder to the parietal peritoneum

was in vogue this seemed to offer a reasonable explanation for the formation of adhesions. When Dr. J. E. Summers, of Omaha, reported his method of using a purse-string suture around a rubber tube in the fundal opening in the gall-bladder and holding the peritoneal surface so closely about the tube as to make a water-tight joint, and abandoned suture of the gall-bladder to the peritoneum of the abdominal wall, I felt that the problem had been solved and that this would do away with adhesions. To a certain extent this was true. A distinct improvement was noted in the post-operative complaints, but the complaints did not vanish. There were still too many patients returning with adhesions. As someone has remarked, "post-operative adhesions to the gall-bladder embitter the lives of many patients"; and I wish to add that the surgeon and family physician of these patients do not have the sweetest time, either.

In spite of the greatest care and delicacy in handling the gall-bladder and other structures, with the use of pads wet in warm normal salt solution to protect them, the betterment in results was not enough to satisfy.

The question was often asked, why do adhesions sometimes cause such great distress and sometimes apparently none at all? It has been found that they occasionally produce a kink in the cystic or common duct; sometimes they cause a kink at the pylorus, which impedes the normal emptying of the stomach; and at times the great omentum is caused to pull on the greater curvature enough to render gastric peristalsis painful. All of these conditions are sometimes found, but they constitute only a small proportion of the symptom-producing post-operative adhesions.

In my early work I had occasionally removed the gall-bladder because of the pathology which seemed too extensive to permit of a continuance of normal

function. It was early noted that many of these cholecystectomies produced more complete relief than the less radical cholecystostomies. I have been gradually led to the conclusion that a large part of post-operative distress is due to gall-bladder adhesions, and that, if we could avoid these adhesions, post-operative distress would be greatly lessened. Efforts at more careful handling were redoubled, but with only slight improvement in results. The gentlest handling of the gall-bladder peritoneum seems often to produce dense adhesions.

The only effective way to avoid pericholecystic adhesions is to remove the gall-bladder; and, I believe, this is the most potent argument in favor of indiscriminate cholecystectomies. Surgeons have been compelled to resort to this measure because of the very unsatisfactory results following the more conservative operation. If any effective means could be found for preventing post-operative adhesions most of the gall-bladders now removed could be profitably retained.

Removal of an organ of as much consequence as the gall-bladder is not ideal surgery. Even though a small mimic gall-bladder forms after the real viscus has been removed, it cannot perform its functions as well as the parent organ. But for the present, at least, so frequent are post-operative symptoms because of gall-bladder adhesions that cholecystostomy should rarely be done.

Even if such an ideal good should be gained as a method to avoid post-operative adhesions of the gall-bladder, there will still remain a comparatively large percentage of gall-bladders that are intrinsically so crippled that they will have to be sacrificed. Normal elasticity, normal contractility, a healthy mucous membrane, and a normal duct are all necessary to insure normal and painless function. Lacking in any of these the viscus should be removed.

DISCUSSION ON THE TWO PRECEDING PAPERS

Dr. Clifford U. Collins (Peoria, Ill.): I can sympathize with Dr. Magie because three or four years ago I went through what he seems to be going through. When Dr. W. J. Mayo made the statement that he was removing 85 per cent of gall-bladders I was horrified. I felt that something must be wrong, and I was loath to believe it was myself, but I finally believed he was right. During a period of about a year and a half I wrote three papers on the subject, each one being a gradual evolution, and coming closer and closer to the removal of the gall-bladder. I was trying to convince myself all the time that he was wrong. I wanted to test this out, and so I got in touch with my patients. In 1915 I wrote to all the patients I had operated on for gall-bladder trouble, and I received responses from the majority of them. Twenty-five per cent of these patients were not cured; they were still complaining of digestive symptoms. They did not have gall-stones, but had a lot of digestive trouble. There were things they could not eat, and they were not well. I found out what Dr. Davis mentioned in his paper, namely, that nearly all of those patients on whom cholecystectomy had been done were well; they did not complain of anything. At that time I read an article by Swope, of Pittsburgh, in which he spoke of having sent a letter to a large number of patients, and from the replies he found that 27 per cent of them were not well. About that time I operated on a doctor and drained his gall-bladder. I received a letter a year afterwards, saying that he was perfectly well. Two weeks later he began to have trouble. He suffered for six months, and then Dr. C. H. Mayo removed his gall-bladder, and I know now the patient is perfectly well.

These things began to make me wonder, and I began to think perhaps the proper thing to do is to remove the gall-bladder in the great majority of cases. A few years ago I began to try to prevent adhesions by using the method of Dr. Andrews of interposing the colon between the gall-bladder and the stomach and putting omentum there, but I finally became convinced it was impossible to prevent adhesions of the gall-bladder if there was infection, and that drainage for ten to twenty days will not stop infection of the gall-bladder. It is almost a closed viscus, and a few days' drainage will not relieve infection. Since then that percentage of 25 has crept up to nearly 50 per cent. I drained the gall-bladder of a woman in 1906, twelve years ago, and she is suffering now with

trouble from the gall-bladder, and I shall have to take it out.

In one case of so-called strawberry gall-bladder I resorted to drainage, and the man did not have any trouble for three years thereafter, but since then I have had to take the gall-bladder out, and I have now become convinced that cholecystectomy is the best thing to do.

Two or three years ago Dr. Willard Bartlett suggested a method of keeping in touch with patients after operations, and I have followed it since. I presume that a good deal of the discomfort from which these patients suffer for about six months after cholecystectomy is due to the gall-ducts adjusting themselves. After that time they settle down, and are well. When cholecystostomy is performed, patients vary from six months to two or three years before having trouble, or reinfection takes place, and they are not well. I do not hesitate now to remove 90 per cent of the gall-bladders in patients that come to me.

Dr. Emil G. Beck (Chicago): We have heard two interesting papers this morning, the author of one advocating the removal of the gall-bladder, and the other asserting that it should not be removed, proving the statement that there still exists the greatest divergence of opinion. It seems to me, the surgeon should not be prejudiced against either method, and he should simply act in accordance with his best judgment when he sees the individual patient.

There are certain rules which the surgeon may adhere to. A gall-bladder which has been repeatedly infected and is chronically inflamed contains within its walls micro-organisms, and, when such a gall-bladder is drained, it is likely to keep the patient in poor health because of the existence of focal infection, the same as an abscessed tooth will do. We now pay much attention to diseased teeth, and we attribute to the teeth many ailments; and, if we remove the decayed or abscessed teeth, the patient usually improves. The removal of a diseased gall-bladder will usually benefit a patient who has been in poor health very markedly.

The different rules laid down in various discussions have been these: Acute gall-bladders should not be removed; they should be drained, especially after the first attack, because they are likely to return to a normal condition. But old adherent gall-bladders which have been repeatedly infected should be removed.

With reference to the prevention of adhesions: I saw Dr. C. H. Mayo employ a method which I think will prevent adhesions. When he removes the gall-bladder, he uses the

omentum nearest to the gall-bladder as a sort of a buffer by sewing it around the base of the stump, and then introduces a rubber drain for a few days. In that way he prevents adhesions, which, I believe, as Dr. Davis has said, are the great source of trouble after operations in which the gall-bladder has not been removed.

Dr. Roland Hill (St. Louis, Mo.): The question of removal of the gall-bladder is one that is most vitally important. I felt like Dr. Collins when I saw Drs. W. J. and C. H. Mayo removing all gall-bladders, but with increased experience I have become more and more convinced that a gall-bladder once diseased is like an appendix that is diseased and had better be removed.

There is another factor to which I desire to call attention, namely, some of these cases, where the gall-bladder is not much thickened and where there are not many adhesions, give more actual distress than the cases in which stones are present.

I had one case recently that had been operated on by another surgeon, and nothing could be felt in the gall-bladder. The appendix was removed, but the patient did not recuperate. Three months later I had to operate on this patient (a nurse) for gall-bladder disturbance. I found some adhesions around the cystic duct, kinking it. Since then she has gained forty pounds, and is now absolutely well.

Two other cases I remember distinctly within the year. I had operated in such patients for gall-bladder conditions some years before, and found no trouble in the gall-bladder itself. The appendix was removed in each case. A few months ago, I re-operated on both patients, and found small stones in each. At the time of the primary operation these patients evidently had a mild cholecystitis, which gradually became more aggravated as time passed, with stone-formation.

In the past year I have had case after case where the gall-bladder had been felt by other men, and found that the only way we could get relief was to remove the gall-bladder. If the gall-bladder is removed early there is much less danger of infection and trouble in the ducts and the liver itself.

Dr. Willard Bartlett (St. Louis, Mo.): I think it was Professor Beyer, of Leipsic, who told the members of the Clinical Society in 1912, when we visited his clinic, that stones of gross size removed from the gall-bladder did not

relieve the gall-bladder of all stones, because in the tiny crypts in the mucous membrane in such individuals there were always present stones of very small size. He urged that as a potent reason why gall-bladders containing stones should be considered suspicious, particularly those gall-bladders containing tiny stones; but the disease which originally caused them was still left behind.

I have been unable in my own mind to come to any conclusion, as the rest of you have, whether all gall-bladders should be removed or left in. Just what number should be left and what number should come out I do not know, notwithstanding all the arguments in favor of one side or the other; nor do I think any one else can determine this except at the operating-table. Furthermore, our views oftentimes are conflicting. We have been told to take out a gangrenous gall-bladder, which is correct; and we do not take it out when the patient is too sick, which is also correct. The views advanced on both sides, for and against the removal of the gall-bladder, are likely to conflict in a given case. Men of experience have developed surgical instinct in gall-bladder cases, as in other cases, and, without stopping to weigh every argument on the two sides, they proceed from that instinct on what turns out to be the best plan according to the individual case. That is about my own feeling in the matter, and I had not thought of it until sitting here and hearing these different arguments. I remember going around the hospital the other day, and explaining to a patient on whom a gall-bladder operation had been done the day before, that I had to leave the gall-bladder in because I did not know whether it should come out or not. I said, "You were too sick to take the gall-bladder out, and you may have a return of your trouble. If you do, you must come right back, and we will keep the charges down"; and so on. I find myself hedging on every patient whose gall-bladder I have left in because there is a reasonable chance that the patient is going to be displeased with the result.

Dr. Joseph Ransohoff (Cincinnati, Ohio): While one may hesitate as to whether or not the gall-bladder should be removed in a given case, at the same time, in the end, the surgeon may have to take it anyway.

I think I was one of the first, if not the first, to do a gall-stone operation. The patient was a man, aged 76, profoundly jaundiced, and so septic that I would not touch such a case today. You know what the end-result was. The case was reported as a "gall-stone operation" at the time.

I am one of those who believe that it requires a great deal of courage in most instances to take out the gall-bladder, provided you are sure you have taken out all the stones. If you are not sure of having removed all the stones, I suppose it is better to drain the gall-bladder. When the gall-bladder is infected, and you cannot feel the ducts are clear around, sometimes it is possible to get the finger in there and feel all around the common duct, and it is safer to leave such a gall-bladder, because the stones will come out.

Dr. A. J. Ochsner (Chicago, Ill): I have at the present time two patients whose gall-bladders have been removed. I have had quite a number of these cases whose gall-bladders have been removed by the best of surgeons. You will all get them by the dozen very soon because everybody is removing gall-bladders. It seems that every Swede or Pole who has trouble after the removal of his gall-bladder goes to Augustana Hospital or St. Mary's. They are going there by the dozens after they have been supposed to be cured by the removal of their gall-bladders. They come back complaining of exactly the same symptoms they had before operation, only they are coming about three times as fast as the patients who have had their gall-stones removed and their gall-bladders left in.

Dr. Stanton followed a lot of our cases (I do not remember the exact number), and he found that many of the patients in whom we used a drainage-tube after the removal of the gall-stones had to be operated on again. He found that when we packed the gall-bladder with gauze and sutured it to the peritoneum and transversalis fascia the patient remained well; and that no sacculation, no ulcer formed as a result of the gauze drainage, and the patients did not require a secondary operation.

At our clinic we sometimes have three gall-bladder patients in one morning, and of that number I may remove the gall-bladder in one. Sometimes I may remove the gall-bladders in all three. If I am reasonably sure that there is something wrong about the cystic duct, or that the mucous lining of the gall-bladder will not recover as a result of tamponing with gauze, I take out the gall-bladder, so that, when there is a good reason or a good excuse for taking out the gall-bladder, I do it always. If I cannot find an excuse for removing the gall-bladder, after taking out the gall-stones, I always re-examine the case by passing my finger up from the common duct over the gall-bladder, and when there is not a good excuse for removing such a gall-bladder I leave it attached

to the peritoneum and transversalis fascia, tampon it with gauze, and later pull out the gauze and let the case alone.

Since I quit using a drainage-tube in these cases, very few patients come back with trouble, but it was very different when we drained with tubes. I recall having seen within the present week three patients that came back in trouble after cholecystectomy performed by excellent surgeons.

Dr. A. E. Benjamin (Minneapolis, Minn.): I was glad to hear Dr. Ochsner say what he did. I have always believed that it is wrong to advocate the removal of gall-bladders in 95 per cent of the cases demanding operations. In removing the gall-bladder, if you can remove all the disease, well and good; but who knows but that the disease extends up to the hepatic ducts, as it often does? Stones reform, not in the gall-bladder entirely, but in these ducts. Therefore, in order to cure the patient, to attempt an analogous illustration by saying it is like a diseased appendix, and should be removed in all cases, is wrong. You can remove a diseased appendix, but you cannot remove the area in which the recurrent disease occurs by removing the gall-bladder; therefore we should have a loop-hole to crawl out of, and in case of further disease we should leave the gall-bladder in a great many cases.

I have not recently inquired of my patients after I have operated to see what percentage of them are cured by leaving the gall-bladder, but I do know this, not many have come back with symptoms demanding the removal of the gall-bladder. Where we can determine the gall-bladder is diseased, and it alone, it should be removed. If it is absolutely destroyed, and the mucous membrane is not functioning, and the bile is flowing freely into the duodenum, that gall-bladder should be removed; or, if it is gangrenous, not in the acute stage, being destroyed by stone-pressure, it should be taken out. It has been demonstrated that nature endeavors to restore the normal condition in the ducts, after the removal of the gall-bladder itself by the ducts enlarging. It is an indication that nature rebels against man's attempt to improve on her.

Dr. Magie spoke about irrigation of the gall-bladder, which is very good. I have had a number of patients that I have treated in that way. When I was not sure the ducts were clear, or were somewhat constricted, I resorted to hydraulic pressure, and that was helpful. In a man who had cholecystitis without gall-stones, in whom jaundice was very marked, with hydraulic pressure I succeeded in dilating the duct. He

had become very much emaciated, but gained eighty pounds inside of six months.

Dr. E. S. Judd (Rochester, Minnesota): It would seem from Dr. Magie's paper that it is very important that we should compare the healthy gall-bladder with the diseased gall-bladder. There is no question but that our surgery should be based definitely on pathology. We all agree that if there is definite pathology, if the gall-bladder is diseased, it should be removed; but the point that comes up in gall-bladder surgery is whether or not there is anything wrong with the gall-bladder. It was formerly supposed that gall-bladder infections were largely due to infection of the bile, that the infection came through the portal circulation down through the bile, and that stones were formed from the infection. The more recent view is that the infection is carried through the blood-stream and, when it involves the gall-bladder tissue, it is a gall-bladder-tissue infection. If there is infection in the gall-bladder the gall-bladder should be removed. Removal of the healthy organ is contra-indicated, but, in all probability, there are many gall-bladders that do not appear to be infected when they really are. We undoubtedly have two separate conditions to deal with, one a cholecystitis with stones and the other a cholecystitis without stones. If the disease in the gall-bladder is to be cured that organ must be removed. If the infection is in the bile-stream drainage may remove the stones, and cure the case.

Dr. W. D. Haines (Cincinnati, Ohio): It is a difficult thing for me to go home, and discuss this subject in practice with my patients. I draw considerable inspiration from this Association every year, but it takes me two weeks after I return home before I can reconstruct my ideas concerning what you have been gradually teaching me.

Formerly, I was an advocate of retaining the gall-bladder wherever it was possible to do so, but now I find every year I hedge a little more and a little more; and am cleaning up some of the mistakes I made in not removing the gall-bladder. Like my friend from St. Louis (Dr. Bartlett) I have been hedging, and telling my patients that they cannot get complete relief from gastro-intestinal symptoms by one operation. I tell them I have done what I could to the best of my ability, and with the little sense that the Lord has given me.

It seems to me, if we consider the subject in the proper light, we are probably operating in a great many cases for

symptoms rather than for real disease, and our surgical work is based on our ideas of pathological conditions, focal infections, and so on. Suppose a man has sinus infection or infection in the apical canal, and is getting lesions of the heart, of the stomach, or of the gall-bladder, what should be done? If you drain one pocket you may not remove the cause of his trouble. He may have multiple abscesses about his body. You can drain a little abscess there and another here, and presently there will be another. By so doing you have not removed the underlying condition, and that is difficult to determine. So we are dealing simply with symptoms. You may tell a patient who is manifesting symptoms to get rid of some of the old bridges he is wearing in the mouth. You may tell him to get rid of a lot of decayed teeth, and after removing them the dentist may think he is going to relieve the patient of his symptoms, but he may not be able to do so, and the seat of the trouble may be elsewhere. Notwithstanding what has been said, I believe all of us are coming to the position that more and more we should remove these gall-bladders. The practice is more or less modern, and, as the doctor told us, he is getting his cases back the same as he got them back when he did cholecystostomy.

Dr. R. W. Corwin (Pueblo, Colo.): I would like to ask a question. Is there any way for us to tell while operating whether the gall-bladder should be removed or not? Is there some method by which that can be determined promptly?

Dr. M. L. Harris (Chicago, Ill.): If we are wise we will profit by the experience of others, but, naturally, we all get to the point where we depend very largely on our own experience to guide us. My mistakes in judgment have been in the lines of not removing the gall-bladder, so that I have had to do secondary operations a number of times to remove gall-bladders which I failed to remove at the first operation. I never have had to put back a gall-bladder that I had removed at the first operation. (Laughter.) So I am very much inclined to remove the gall-bladder if there is any doubt about it.

Dr. Magie (closing on his part): I came here to get my mind cleared up on this gall-bladder question: It seems to me it has become, instead, more muddled than before.

In answer to Dr. Corwin's question about telling whether the gall-bladder is diseased or not: I would urge that he examine it carefully before he removes it, and come to a conclusion whether it is diseased or not.

I also want to protest against removing a gall-bladder just because it is diseased. I do not think that is scientific surgery. We do not take a man's eye out when it becomes diseased. When a patient has a diseased kidney, we open it, take out the stone, and drain the abscesses; and the patient gets well. We know personally that the kidney has a function, and it is one that we can demonstrate several times daily. Unfortunately, we cannot observe the function of the gall-bladder so readily as we do that of the kidney.

Physiologists tell us that, at certain intervals during the early stages of digestion, bile is poured into the duodenum, and it is necessary for the bile to remain in the gall-bladder, where it undergoes certain chemical changes, which better fit it for the process of digestion. Corresponding to the early stages of digestion, it is discharged into the duodenum, where it has to do with the digestive processes.

When the gall-bladder is removed the common-duct sphincter is soon overcome by the increased pressure, then the bile flows steadily into the duodenum. The capacity of the liver to manufacture bile is limited; therefore there must be a time in the absence of a gall-bladder when there will be a deficient amount of bile discharged into the duodenum, and as a result imperfect digestion must follow. Consequently, it is fair to argue that digestion cannot be perfect in a person whose gall-bladder has been removed.

Dr. Harris made the remark that he had never been asked to put the gall-bladder back after he had removed it. That probably is true, but if some of them could speak, they might make this request. Many of my patients have not given me a chance to put it back; they died. (Laughter.)

Dr. Davis (closing on his part): This is the most satisfactory discussion I have heard for a long time in that no two speakers have agreed (laughter), but, after listening to the different speakers, I find that I can agree with every one. When some one gets up and says it is a bad thing to remove the gall-bladder, I certainly and unhesitatingly agree with him; and when some one else says that, if you are going to get anything like relief of the symptoms, you must remove the gall-bladder, I agree with him. This whole discussion goes to show that at the present time the profession, as a profession, is absolutely at sea in regard to what to do in these cases. When I remove a gall-bladder I have the feeling that it is a confession of weakness on my part, that I am unable to cope with the condition, and I realize that I am not doing ideal surgery. It is not ideal surgery to re-

move an organ in this way; and I often think of the changes that have been made in certain other fields of surgery,—for instance, not very many years ago in time of war practically every gunshot wound of the extremities was followed by amputation. In the present war a good proportion of these extremities are saved, and we feel that a whole lot has been accomplished. I have the feeling that some day we are going to get on a like basis with reference to gall-bladder surgery and we will not have to take out these gall-bladders.

At the present time, as I stated in my paper, I get better symptomatic results by removing at least a good proportion of these gall-bladders. I used to limit my cholecystectomies to cases where I could see gross pathology in the gall-bladder or cystic duct, feeling that was the only thing to guide me, but I found a lot of the patients who, at the time of operation, seemed free from pathology, later came back when I had only drained the gall-bladder. Perhaps I should not have said a large proportion of them, but many of them. Many times, when I did not remove the gall-bladder, I felt like going around and apologizing to the patient, and preparing the way for him to come back and have another operation done. That is the attitude we have been in right along. When we remove this organ we are doing something that is beyond us, and we are not able to combat the pathology, although this is a rather radical procedure.

In regard to Dr. Corwin's question of telling whether the gall-bladder is diseased, or whether there is something back of that, and so on; I do not think any of us can tell. We sort of hedge in these particular cases, and say, "This gall-bladder ought to come out." Sometimes we are right, and sometimes we are wrong. This has been so in my own experience.

Some years ago I remember having had two cases one morning that were exactly alike, both patients presenting the same line of symptoms, which were as classical as anything could be, and the gall-bladder in both cases did not seem very much diseased. In the first case I did not take out the gall-bladder. I left it and drained. In the second case I had a good chance for comparison, and said, "I will take this gall-bladder out," and I did so. In the particular instance in which I did not take out the gall-bladder the patient came back for the removal of the gall-bladder eighteen months afterward. In the patient from whom I removed the gall-bladder the symptoms were comparatively relieved. I believe we get better symptomatic results in a large number of

these cases where we remove the gall-bladder than where we do not, and that is the reason I do it; operation is not ideal. This thing is not settled, and I believe the more we thresh it out, the more likely we are sometime to come to a better conclusion in regard to what to do.

SOME TECHNICAL POINTS IN GASTRO-ENTEROSTOMY AND GASTROPLICATION

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ST. PAUL, MINNESOTA

The technic of gastro-enterostomy has been established for such a long time and has been so copiously discussed and illustrated, that I hesitate to present a few minor points, which may have been part of the technic of many others. Nevertheless they seem of sufficient interest to be discussed in brief. They apply to the side-to-side methods. The Y-shaped gastro-enterostomy is not considered in this paper.

The bugbear of gastro-enterostomy has been for a long time the vicious circle; and it has never quite disappeared. No doubt, atony of the stomach walls is an important factor in its formation. The surgeon, therefore, has to do everything possible to secure an easy outlet from the stomach and to avoid the creation of any difficulty of passage. The manner of attaching the gut, whether this be in the iso- or the anti-peristaltic sense, has produced much discussion. The easy floating away of the efferent loop has always been the one factor considered, though this is perhaps of less importance than what happens to the afferent loop. Nevertheless it must be admitted that, in case the efferent loop should become fixed, even in a moderate way, by postoperative adhesions, a kink may be disastrous. While a free intestinal loop, even if kinked, may easily move on its contents, the difficulty at the site of the gastro-

enterostomy lies in the circumstance that the peristaltic wave of the gut, when it passes the gastro-enterostomy opening, loses much or most of its chymus, in case the stomach is greatly relaxed. The vis a tergo thus is lacking. Under these conditions it is possible that even comparatively slight obstacles become serious. Anti-peristaltic attachment of the jejunum may give better results to many operators, because by this procedure the inlet is kinked off, a beneficial feature in itself.

If the pylorus is patent, food will pass through it even after gastro-enterostomy, and will appear at the afferent loop. The afferent opening will, therefore, not have the same tendency to contract and remain contracted as the distal jejunum, which in case of atony of the stomach is not forcibly offered food. Now as soon as there is no free outlet from the lower opening, the duodenum and the jejunum above the gastro-enterostomy will become distended. In vicious circle the afferent loop becomes so ballooned that the efferent opening is compressed and pushed out of the way. To guard against all this we should bear in mind the picture of this fully established vicious circle. We, therefore, have to see that the afferent opening cannot become too large, because by enlarging it annexes that orginally neutral territory, the portion of gut which lies between the two ends of the gastro-enterostomy incision. It annexes it for the formation of a wide funnel, and the lower jejunal opening is then pushed to the wall and more or less shut by a spur. Besides the guarding against a too wide upper opening we must remember that the upper loop can become very large and bulging. Even if the upper opening is reduced in size, the distended loop above it, though very short, could become so large that it might compress the outlet. For this reason we

Fig. 1.

Fig. 2.

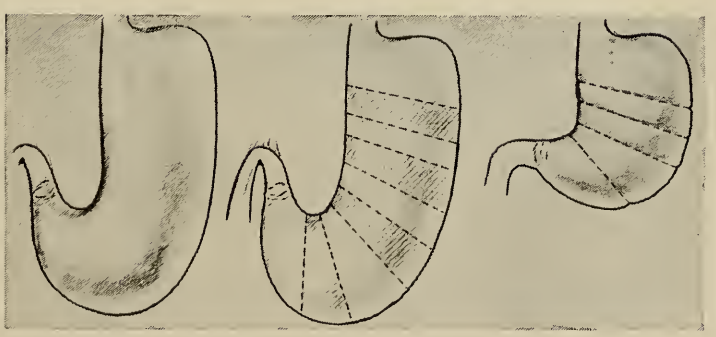

Fig. 3.

do well to fix the afferent gut for some distance on the stomach. For the efferent gut it is desirable that it lead rather freely away from the stomach, and that its opening be somewhat funnel-shaped. To accomplish this in posterior gastro-enterostomy we have for years used the following simple means (Figs. 1 and 2):

First. The stomach is drawn through the slit in the mesocolon as far as is feasible.

Second. The edge of the mesocolon is fastened to the stomach as far on the periphery as possible. In front the mesocolon is often feally fastened to the anterior wall of the stomach by grasping the stomach wall through the omental attachment, where it can be had between vessels.

Third. The gastro-enterostomy is made large enough to allow the tips of the four fingers in it.

Fourth. The loop is attached in the isoperistaltic sense; and the stoma extends from a point about halfway between the greater and lesser curvatures on the afferent (left) side to close to the greater curvature on the efferent end. Thus, after the stomach is replaced, the gastro-enterostomy opening has a downward course on the posterior wall of the stomach, and is as much a postero-inferior outlet as can well be procured.

Fifth. After the posterior Lembert suture is placed, the gut incised down to the submucosa, the second suture applied and the mucosa opened, we then make it a point to grab with the third suture a broad edge of mucosa. It never appealed to me to excise the mucosa. What protects the tissues against secondary ulcer on the suture line is the mucosa, and for this reason we prefer to secure a bulky covering by pulling ample mucosa over the wound. For the same reason that we are principally concerned to secure a tight covering with

mucosa we do not lay great stress on carefully inverting the mucosa when the anterior half of this suture is placed. If the edges are somewhat everted, the suture does not look as neat; but seen from inside there is no exposed submucosa. The middle suture buries this eversion, and the sewing goes more quickly.

Sixth. The anterior Lembert suture is placed in such a manner that, after the distal half is finished in the ordinary way, it not only pulls the jejunum on the proximal half over to the left and upward by a slanting direction of the suture (Fig. 1), but the suture in its progress toward the left angle gradually includes broader peritoneal surfaces and thus pulls the gut over onto the stomach. This creates a narrowing and a kinking of the afferent gut, and at the same time brings about a broader agglutination at the point where the most pulling is to be expected. The lower jejunal opening is drawn into a more favorable position and its lumen is held open and free from obstructing folds, while the upper opening is rendered rather inaccessible from the gastro-enterostomy side. This point I have demonstrated many times and it appears to be of value. The sketch shows the suture in a somewhat exaggerated way to emphasize its peculiarity. In reality it is usually preferable not to grasp quite as much surface, and to increase the effect to the desired degree by a few additional interrupted sutures. The kinking and therefore comparative inaccessibility for food of the afferent loop is probably, as mentioned before, a beneficent feature in the anti-peristaltic attachment method; and this principle is underlying in Polya's attachment of the gut after resection of the stomach. We make use of this same principle whenever an anterior gastro-enterostomy has to be performed, and the necessity

of making an entero-anastomosis in this procedure is thus avoided.

In ulcers of the lesser curvature excision is advised by leading authorities. Rutherford Morison, however, among others had good results with gastro-enterostomy alone. End-result inquiry in our very small material yielded the following results: Of ulcers of the lesser curvature distinctly away from the pyloric area there were in our material ten cases. In two a resection of the stomach, including the pylorus, was performed; both report themselves as well (after three and one-half and two years). Another case, after good operative recovery, could not be traced. One patient, operated on one and one-half years ago, is greatly improved. The remaining six patients were entirely relieved by the operation.

In these cases the aim was to make the opening in the stomach away from the pyloric grinding mill, but still at the bottom of the stomach. Furthermore, we were anxious not only to make the outlet extra large, but to pull enough stomach through the mesocolon to have it pouch. If a rapid and free emptying is particularly desired, an ellipitcal excision of the edge of the gastric muscularis, not necessarily including the mucosa, may be of assistance.

GASTROPLICATION

Atony of the stomach with a sagging downward and a dilatation of this viscus is a condition which is found in patients who usually have suffered for a long time from stomach symptoms due principally to retention and from a reduced nutrition. Time does not permit dwelling upon the different methods of treatment in these cases with their mostly unsatisfactory results. Suffice it to add

that, though the surgeon withholds operating as long as he can, he may be driven by the severity of the symptoms and the prolonged misery of these patients to try operative relief. Bircher as the first one offered a reefing of the stomach which produces horizontal folds, through which the greater curvature is raised and its distance from the lesser reduced. Now on examination, these stomachs, for the most part, show that even the lesser curvature has greatly sagged down and the whole organ is like a long bag hung up only on the two ends; for example, the cardiac and the pyloric area. On the pyloric side the attachment is not to the pylorus proper so much as to the first portion of the duodenum, where the fixation occurs by the gastroduodenal artery, the bile ducts and the extra-peritoneal attachment to the pancreas. A kink in the uppermost portion of the duodenum is the consequence. The kink in its turn causes a more or less marked retention with a gradual dilatation as a further result.

Gastroplication as advised by Bircher creates longitudinal folds in the stomach. The whole organ assumes the shape of a long sausage. The sagging of the lesser curvature is not changed and the acute angle at the outlet is not improved. However, if the folds are made in a transverse direction, the stomach is very much shortened by them. The degree of shortening can indeed be chosen by the operator. He can make as many transverse folds as seems necessary. Through this the stomach is lifted toward the cardia, and the lesser curvature is shortened and stretched. The kink at the duodenum is effectively counteracted.

In general one is very reluctant to credit any operation to this type with much merit, and let me add that I myself am not enthusiastic about

such methods. Nevertheless, one is at times confronted with a case in which the ptosis is so severe that some corrective measure, perhaps in addition to a drainage operation, appears desirable. Even admitting that the stomach probably undoes our folding after a while, and conceding that improvement after these operations, when done in conjunction with a drainage operation, is principally to be attributed to the latter, our experience leads us to believe that there is some merit in the procedure. The posterior wall was left untouched in our cases. It could, of course, be reached to some extent through an opening in the gastrocolic ligament; but it seemed too much surgery in view of the moderate promise of such a surgical interfence.

In the course of a study of the end-results of our stomach operations during the last fifteen years, we have found thirteen cases of severe dilatation and ptosis. In one we simply made a gastro-enterostomy and had a good result. In the remaining twelve cases we performed the transverse reefing of the stomach. However, on account of a distinct retention we added a gastro-enterostomy in six instances and a pyloroplasty twice. In four cases nothing but the reefing was done. The questionnaire yielded the following end-results:

Two only slightly, if any, improved after two and four and one-third years.

Two improved after three and one-third and six and one-half years.

Four greatly improved after five and three-quarters, six and one-half, and seven one-third years.

One practically well after five and one-half years.

Three very well after five and one-half, nine and one-third, and fourteen years.

One not found (after good operative recovery).

The four cases with nothing but a gastroplication are:

One slightly improved after four and one-third years.

One greatly improved after six and three-quarters years.

One very well after nine one-third years.

One not found.

I simply give these data for what they are worth. The indications for such a procedure are surely very

limited and rather rare, but as long as plication is still done now and then in cases of an extreme condition, it seemed permissible to bring this modification to your attention, because it corrects, or helps to correct, the kink at the outlet of the stomach.

FOR DISCUSSION SEE PAGE 237

PERFORATED GASTRIC DUODENAL ULCER

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The treatment of perforated duodenal and gastric ulcer is a settled problem to most surgeons; to the student of the literature of the subject it becomes obvious that each has settled it in his own way, and that the solutions arrived at have little in common except the necessity for closing the perforation. Based on a personal experience of seventeen cases, and a study of some fifty odd cases operated on in Cook County Hospital in a period of five years, the writer offers the following propositions:

1. The peritonitis resulting from a gastric or duodenal perforation is but slightly, if at all, infective during the first hours following the accident, and, therefore, it must not be treated as a suppurative process.

2. The degree of patency of the pylorus after closure of the perforation alone does not determine the indication or otherwise for a gastro-enterostomy.

3. The operator's technic, wholly irrespective of the method he uses, determines, in a high degree, his mortality.

The Peritonitis.—The normal stomach and duodenum are practically sterile much of the time. In the presence of an ulcer this is not the case, but the amount of infective material present must usually be very slight. It is a common experience, borne out by the histories of the cases here studied, that many of the patients give no history suggestive of any degree

of pyloric obstruction. Not rarely the perforation is the first evidence of the presence of an ulcer; usually the history is that of an active ulcer of the type likely to be accompanied by a hyperacidity and rapid emptying of the stomach. The ulcer itself is an infective process; but the stomach contents are practically sterile, and when emptied into the peritoneum produce the violent reaction of a chemical irritant. Some years ago I published a report of a case in which there was a widespread fat necrosis, and some experimental work in which I succeeded in producing a typical widespread fat necrosis by making a perforation of the duodenum. Several of the cases in the series studied in this paper present such a peritonitis with fat necrosis. All this reaction is, however, a chemical reaction; it calls for mechanical emptying of the peritoneal cavity. The one thing that logically is to be avoided is to leave gauze or tubes in such a peritoneum for drainage. Such drainage must surely entail the danger of infection to the already badly damaged peritoneum. Where actual solid masses of food are present an incision in the midline below should be made of sufficient length easily to investigate the more dependent parts of the abdomen and remove them, or, if too numerous and the condition of the patient forbids, drainage may here be instituted. But this is an exceptional occurrence. It has not occurred in my own experience, though perforation often follows the ingestion of food, and some particles may be found in the peritoneum.

When it is remembered that in the vast majority of cases the perforation is very small (less than 5 mm. in diameter) it will be readily understood that the expression "the peritoneum was full of food" is usually imaginative rather than descriptive. That drainage cannot materially aid the escape of solid food masses, and that in my cases recovery occurred with-

out such drainage, must be regarded as evidence of a positive value of the uselessness of the attempt to drain. Drainage instituted because of the presence of solid food masses must be regarded rather as a safety factor in the event that suppurative peritonitis should develop; but, since the gauze and tubes will surely be walled off from the free peritoneal cavity many hours before the development of the suppuration that they are intended to relieve, the futility of the procedure must be obvious. In my earlier cases, in which I was accustomed to drain, I was struck by the obvious ineffectiveness of the procedure. Data are lacking as to the exact time elapsing between the perforation and the operation, but among those personally operated upon one was twenty-five hours old. Among the records of the Cook County Hospital several cases are included in which the perforation was a number of days old; in these instances the perforation must have been incomplete, giving time for walling off processes to develop. Here actual suppuration might easily have been present, and drainage of the local abscess justified.

First, then, I should conclude that drainage is almost always uncalled for in early perforations of gastric or duodenal ulcers. Drainage may be instituted, first, in late cases (after eighteen hours); second, in the rare instance of inadequate closure of the perforation due to physical inability adequately to invert the lesion; third, where gross masses of stomach contents are spilled into the peritoneum.

Gastro-enterostomy.—Is a gastro-enterostomy called for after closing a perforated ulcer? Diametrically opposite views are presented in a most arbitrary manner. Deaver always does a gastro-enterostomy; others never do a gastro-enterostomy. It seems to me that gastro-enterostomy has a double function to perform; first, and obviously, to relieve existing obstruc-

tion due to the inversion of the ulcer, and, second, and of fundamental importance, the therapy of the existing lesions in the stomach.

The first of these, the relief of obstruction, applies only to duodenal and pyloric ulcers. When adequately inverted, these should almost always produce obstruction. It is no evidence of skill that such an obstruction is avoided; rather it is frequently an evidence of inadequate inversion of the calloused ulcer. Moreover, that clinical patency is found to be present, when at operation obstruction seemed likely, is evidence only that the stomach is capable of compensating for a high degree of obstruction, which it should not be called upon to do, as we hope to show.

The therapy of the existing stomach lesions.—It is agreed that the perforation is one of the surest cures for gastric ulcers, almost devoutly to be hoped for as ending the disease; therefore closure of the perforation is all that is required. It is a cure for the ulcer involved in a limited number of cases (70 per cent according to Paterson); but in from 20 per cent to 50 per cent of the cases of active ulcer causing perforation the lesion is multiple. The autopsy findings at the Cook County Hospital are incomplete on this phase of the subject; the only patient of my series who came to autopsy showed seven active ulcers; two besides that which perforated were extensively necrotic, and four were in various stages of activity. The value of gastro-jejunostomy in such a case can hardly be overestimated; not merely its late effect, but its immediate action on the perforation and on the active ulcers.

There is a note in some of the records that the stomach wall is found too friable for suture. Such a statement is evidence that the operator lacks a proper apprehension of the principles underlying the closure of a perforated ulcer. The perforation is but a small

portion of the gross ulcer. In closing the perforation the entire ulcer should be embedded. It is for this reason that the lumen of the pylorus and duodenum will usually be closed if an ulcer is adequately enfolded.

Excision of the ulcer.—Excision of the ulcer, its closure with free fascial transplants, the cauterization of the perforation, etc., are all unnecessary complications of the technic of treatment. In the presence of an emergency fraught with danger these unnecessary additions to the operation are uncalled for. Through-and through suturing, grasping the entire ulcer as well as the perforation, is effective in destroying the lesion.

The operator's technic.—Technic, after all, plays an important part in results, irrespective of the type of operation followed. Though there is found to be a benign peritonitis during the early hours following the perforation, the abdominal viscera will not withstand excesssive traumatism. Whatever operation is done, it must be carried out with a minimum of handling of the parts. The statement, "contents poured from the perforation while the stomach was being drawn from the abdomen," is evidence of poor technic. The rate of traumatism per minute inflicted upon a patient if it could be indicated by a definite unit of measurement would surely be found to vary 1,000 per cent in the hands of different operators, and this materially influences results. A further evidence that the operator's technic plays quite as important a part in the mortality as his method of treating the perforation, is indicated by the fact that several series of perforations have been reported in which the mortality was low, though some were treated by gastro-enterostomy and others not. Examples of this are Deaver's statistics of forty-odd cases with one death, in all of which he did a gastro-enterostomy, and the work of others in which gastro-enterostomies were

not done, and in which the mortality was almost equally low. The elements of technic which play an important part in the mortality may be covered in a few words: First, the incision should be ample to afford the operator easy access to the upper abdomen. The pyloric end of the stomach and duodenum must be so exposed that they can be viewed in situ with a minimum of disturbance. Such an exposure enables the operator to find the perforation without loss of time and, what is more important, without pulling the parts out of their normal position.

It is said to be difficult at times to find the perforation, and it has been suggested to give methylene glue in order to facilitate locating it. In three cases among the fifty operated upon in Cook County Hospital it is noted that the perforation was not found during the operation. I have had no experience of this kind, and I think it likely that a free exposure would practically obviate its occurrence.

Upon locating the perforation, if leakage is taking place, a finger should be placed upon it until a through-and-through running suture can be so placed as to whip it in. There is no occasion for any special type of suture. The object is immediately to close the leak. The perforation and the ulcer, of which it is a small part, should now be thoroughly enfolded with as many sutures as are required adequately to accomplish the purpose. When the perforation lies close to the pylorus and the area of induration is wide, it may be desirable to turn the first portion of the duodenum acutely upon the stomach, and suture it there. The essential step at this part of the technic is to bring good broad peritoneal surfaces together. Fowler's position, nothing by mouth, and the use of large quantities of water per rectum constitute an important part of the after-treatment.

Of the seventeen cases personally operated on drainage was instituted in six or seven, being used in all of the earlier cases. In all but one instance where drainage was used it was through an extra suprapubic incision. In one case drainage was carried down to the perforation itself. In this case the perforation opened up within forty-eight hours, and all stomach contents were discharged almost as quickly as swallowed. The patient died within a few days, and constituted the only operative death in sixteen consecutive cases. In one case in which drainage was not instituted a subphrenic abscess formed, followed by a pleural empyema. This patient died in the fourth week following operation, after making a prompt primary recovery. The extension of the infection to the pleura was probably due to inadequate drainage of the subphrenic abscess. The seventeenth case of the series died of a generalized peritonitis. Autopsy showed the presence of seven active gastric ulcers.

DISCUSSION ON THE TWO PRECEDING PAPERS

Dr. W. D. Haines (Cincinnati, Ohio): There are two steps in the technic employed by Dr. Schwyzer and to which reference is made in his paper that are of great importance in making an anastomis between the stomach and duodenum. The principle laid down by Hartman years ago to put one or two interrupted sero-muscular sutures at either end of the stoma is of great importance, as was well demonstrated by the specimen which Dr. Schwyzer exhibited in connection with his paper.

In his case the afferent loop was kinked. I do not think this should interfere with continuing the suture line well beyond the margin of the opening.

This can be demonstrated very readily by pushing up the field of operation like this (indicating). If the suture is continued to this point (indicating) there is absolutely no interference with the outlet, but if the sutures are not placed the stoma becomes distorted by the downward tugging of the loops of the jejujum, thus interfering with the passage of the stomach contents through the stoma into the bowel.

Although the surgeon is operating upon an empty viscus he must always keep in mind the fact that the artifical opening is intended for drainage of a partly filled stomach and that the distention by food will cause a change in the field somewhat like the illustration which I have tried to demonstrate on the blackboard.

The second point, so well put in the paper, applies to the technic in all anastomoses of the gastro-intestinal tract.

The surgeon who trims the mucosa makes a nicer looking job from a mechanical standpoint; but from a physiological point of view it is a dangerous sort of thing to do. By excising the mucosa flush with the retracted margins of the divided intestinal and stomach walls one may make a neater looking anastomosis; but it is at the expense of the protecting influence of the mucosa in the prevention of peptic ulcer at the site of the anastomosis.

Peptic ulcer at this site is a clinical curiosity; still it does occur, and, I believe, it is primarily due to depriving the muscular coat of the protection afforded by the mucous coat, thus exposing the field to the direct influence of the gastric juice.

The doctor spoke of plicatiom of the stomach wall for the relief of prolapse. I have employed this method in a few cases in dealing with prolapsed stomachs which showed great delay in emptying in cases wherein we could find no other cause for the delay than the distortion produced in the pyloric end by the displaced stomach. I followed the technic as described by Rovsing, bringing the ends of the sutures, after plicating the stomach wall, through the abdominal wall a short distance from the median line two or three inches below the tip of the zyphoid, and tying the sutures lightly over a piece of guaze. Primarily the patients did very well, they felt better, took food with a relish and gained in weight but with few exceptions the old symptoms returned in a few months, hence the end-results in the patients submitted to this operation have not been very encouraging in my experience.

In reference to perforations of the gastric or duodenal wall by ulcer: I think they should be classed as the most urgent surgery which falls to our lot. Generally speaking, far better results will follow if we content ourselves with closing the perforation by securing a water-tight joint. The patients are notably poor risks, many of them having a remarkedly reduced resistance from long suffering and lack of proper nourishment, hence they are in no condition to

withstand a prolonged operation entailing resection of the ulcer-bearing area or gastrojejunostomy in addition to closing the perforation. I am glad to learn that Dr. Richter can close these indurated ulcer perforations without excising the indurated margins for I have not been able to do this without removing the indurated tissue surrounding the perforation.

My difficulty in attempting to close without removing the induration has been in getting the sutures to hold when placed in this tissue.

When traction is made on the suture, it cuts through before the margins of the perforation are brought together, unless one goes well beyond the induration into healthy tissue, which distorts the wall and interfers with the motility of the stomach.

It requires but one sweep of the knife on either side of the perforation to remove the indurated tissue, and this will permit one to make a through-and-through suture, bring the cut surfaces together, and form a dependable closure, if, in addition, we put in a double row of sero-muscular sutures and, above all, tack a piece of omentum over the surface to reinforce the field.

Dr. Byron B. Davis (Omaha, Neb.): I want to say a word or two in connection with the points raised by Dr. Richter in his paper, and one of them is as to whether or not to do gastro-enterostomy at the time of the operation. I do not feel that we can lay down any hard and fast rules with regard to this. I have done it in some cases, and I have omitted it in others; but I do believe we have some absolute contra-indications to this operation. It has been my experience to have had a number of these cases come to me very late, and of course I will admit what the doctor says with reference to the early symptoms, the patients do not show much infection, yet after three or four days you may get peritonitis. Your patient is in a serious condition, such a condition that you want to make the operation as short as possible, and, if you have peritonitis, you are not likely to get a good result by doing gastro-enterostomy. In cases of that kind I do just as little as I possibly can. I infold the ulcer, being careful to pass the sutures longitudinally with the duodenum or pylorus, in order as little as possible to contract the opening, and in these cases I use drainage. I not only use drainage locally, but I always introduce a large tube down to the bottom of Douglas' cul-de-sac passed through a stab-wound above the pubes, and I put the patient up in the Fowler position. A good many of these patients get well, and

I have operated again on them later, and have done gastro-enterostomy.

In the cases we get early, where we can do gastro-enterostomy, I try to close up the ulcer. I have not excised any of them, but I close up the ulcer by passing a suture in the opposite direction from what I do when I expect not to do a gastro-enterostomy, I will pass it transversely, and as far as possible fold that in to close up the pylorus or duodenum, and then I do a gastro-enterostomy; and it seems to me that is an ideal method of doing it. However, I do not believe we should go too far, and do that operation, unless the patient's condition warrants it.

Dr. D. S. Fairchild, Sr, (Clinton, Iowa): In reference to one point in Dr. Richter's paper: I have observed that he objects to dissecting out the ulcer. A case comes to my mind at this time of a young man who is in the military service. He came up four years after operation for examination. We passed him, he was accepted in the Army, and he is now at the front. He had a perforated ulcer of the stomach. It occurred very early in the morning when he was getting out of bed; the pain came on; he had not eaten any breakfast. In getting out of bed he was seized with violent pain, and was in a condition of shock. He was taken to the hospital at once, his condition was recognized, and an operation was done. The ulcer was dissected out.

What I desire to refer to here is in relation to the ulcer: The tissues about it were rigid, the perforation, the size of a lead-pencil, and the scar tissues invited an excision as the best means of securing healing. We made a gastro-enterostomy in connection with the operation, and four years later, as I have said, he came up in the draft, was examined, and accepted and taken overseas, and is now in the service. My reason for mentioning this case is the difficulty of closing an ulcer of that kind without dissecting out the scar tissue which immediately surrounded it.

Dr. James F. Percy (Base Hospital, Camp Kearny, Calif.): We cannot repeat it too often that early operation is the essential thing in these cases. This is going to be the more easily obtained, as far as the men who have been in the Army are concerned and who may hereafter develop a surgical abdomen. You will not have to argue with them in order to convince them of the necessity for surgery in their case. Their army training has already taught them to do what they are told, and, unless there is some extraneous reason for

delay, it will not occur in this class of patients. I am especially interested in the material used for drainage in these cases. I do not believe that we are justified any longer in using rubber tubing or gauze in the abdomen. The drainage of the future is going to be by ordinary rubber dam, such as dentists use, but we must use it as if it were gauze, as far as quantity is concerned. Literally, a yard or two or more of this material can be used tucking it in everywhere and anywhere, in both pelvis and abdomen, thus securing the only efficient drainage that is possible to obtain in these cases. It never sticks; it never, in my experience, has caused an intestinal fistula; and by keeping the gut away from the abdominal wound it permits healing in such a way that I have so far not had to operate for a ventral hernia.

The important thing in its use is not to remove it too soon, and then only gradually, each day an inch or two. I have in mind a desperate case of influenza and pneumonia and appendicitis at the same time. The patient's lung condition was such that we were afraid to operate on the abdomen. Finally, as a forlorn sort of a hope, we did operate. The patient's belly was really in an advanced stage of peritonitis, not localized, with a gangrenous appendix and a large fecolith and a pelvis full of pus. Over two yards of rubber dam, six or eight inches wide, were tucked into every infected area that could be seen, and this rubber was not all out for fourteen days, with a perfect recovery and no hernia.

Dr. Willard Bartlett (St. Louis, Mo.): It was my hope that Dr. Farr or Dr. Harris, who are enthusiastic over local infiltration anesthesia, would say something on this subject. There are a lot of enthusiasts who look at everything from a peculiar slant and trim their procedures to fit their point of view. However, if the patient were a member of my own family who had a perforated ulcer, I am sure I should like to have some one who understands and practices local infiltration anesthesia open the abdomen under it, and I think the member of the family would be happier if the surgeon then did only what is easily done within the province of local infiltration anesthesia, that is, merely close the ulcer. On the other hand, I have seen Dr. Ochsner do a gastro-enterostomy so quickly that it would not add greatly to the peril of one of these patients, provided, of course, a general anesthetic was used. But it would be a dangerous precedent for us to go on record in favor of doing gastro-enterostomy, unless, as Dr. Richter has said, there has been a previous

definite history for this operation in the individual patient. I am almost afraid to say it, but I must admit that there is some truth in what our learned gastro-enterologists say about the results they get in the non-surgical treatment of ulcer. And so in the absence of preëxisting obstruction we must be absolutely sure before resorting to gastro-enterostomy in all these cases. After all, the time element is the one vital factor,—that is the time at which we get these patients. That point has been mentioned, but I might emphasize it by saying at once, when I was doing emergency surgery in the St. Louis City Hospital, where we had people of the poorer type to deal with who neglected their health, so far as I recall the cases we had in the hospital, there were a good many patients who had perforating ulcers, and not one of them got well. I got none of them early, and none got well. Contrasting them with a moderate number which I have had in my private hospital work, practically all of them that were seen in my private work got well, which is another evidence of the importance of the time element. This is an important consideration as you all know very well.

There is one type of perforating ulcer which needs gastro-enterostomy. If you have an ulcer in the lesser curvature and have resected the region, it obstructs the stomach. My attention had not been called to this until I had one or two such experiences, and then I wrote to Dr. W. J. Mayo in regard to it. It was not mentioned, but it certainly does work that way, unless coincident gastro-enterostomy is done.

Dr. Alfred A. Strauss (Chicago, Ill.): Regarding perforating ulcers; I have operated in fourteen cases. If the operation is done, as Dr. Richter describes, infolding the ulcer and the infiltrated area, a gastro-enterostomy is absolutely necessary in practically all cases, because the infolding obstructs the pyloric end of the stomach. If there is a perforated ulcer near the pylorus or the pyloric antrum in which a large portion of the anterior half of the stomach is infiltrated, I simply cauterize the ulcerated area and also a portion of the surrounding infiltrated area, making an oval opening with the long axis pointing toward the greater and lesser curvature. This opening is closed with heavy waxed-silk interrupted sutures, the sutures being placed beyond the infiltrated area and the edges of the incision being brought together the same as the tension suture in the abdominal wall. The normal musculature beyond the infiltrated area is then freed from the mucosa, and an oval piece

of fascia lata is imbricated between the mucosa and the free portion of the normal muscularis with interrupted silk sutures. This covers the ulcer and the entire infiltrated area and does not encroach upon the lumen of the stomach. A highly vascular portion of the free edge of the attached omentum is then selected and placed over the entire area. This not only prevents leakage and hemorrhage, but provides an immediate and much needed new collateral blood supply to that portion of the stomach. It has also been shown in my animal experiments that the omental vessels penetrate into the fascia and surrounding area of the stomach to a very marked degree. This simple procedure, which takes only ten to fifteen minutes, requires far less surgical skill than infolding an ulcer and performing a gastro-enterostomy, leaves the stomach in a more nearly normal anatomical and physiological relationship, and is much less of a shock to the patient.

In producing perforating ulcers experimentally by the silver nitrate and bacterial injection method in animals, we have found that the area surrounding the perforation contains an abundance of leucocytes and phagocytes, and the area beyond this is highly vascular, which explains why these perforated ulcers heal so easily, in contradistinction to the old chronic ulcers which do not perforate and have no leucocytic and phagocytic infiltration and a comparatively poor blood supply.

In ulcers of the lesser curvature, referred to by Dr. Bartlett, in which he always performs a gastro-enterostomy, in addition to excising the ulcer, I have excised sixteen of these ulcers without performing a gastro-enterostomy, even in cases where the ulcer was located near the pylorus. The ulcer was excised in the usual manner; if it was very large the mucosa was freed from the muscularis for some distance and sutured together transversely without including the muscularis. The large defect in the muscularis was filled in with an oval piece of fascia lata, which was imbricated between the mucosa and muscularis with interrupted silk sutures, and a vascular portion of the free edge of the attached omentum was sutured over the entire area. Instead of performing a gastro-enterostomy I simply split the muscle of the pyloric ring and cut a small portion away. This acts the same as cutting the sphincter of the rectum. It will permit the stomach to empty very rapidly, and the cases which were examined fluoroscopically some time after operation showed an emptying time of three to four hours. This

method takes only a few minutes, accomplishes more than a gastro-enterostomy, and I consider it the method of choice.

As to plication of the stomach: I am not in favor of that type of surgery. In the so-called shoe-horn type of stomach, which is narrow and dips away down into the pelvis,—such a stomach will empty in from three to four hours. A stomach in which the greater curvature is close to the lesser curvature is the ideal stomach, and will always empty in normal or less than normal time. The stomach in which the greater curvature is widely separated from the lesser curvature is the one that empties very slowly, and in extreme cases where severe symptoms persist, such as vomiting, in spite of all treatment, a plication may be indicated. I have operated in two such cases by removing an oval-shaped piece of the muscularis from the anterior and posterior wall of the stomach, the incisions running parallel with the greater and lesser curvature. The mucosa was not molested in any way, and the free edges of the muscularis were united by a Lembert suture. This procedure converted a much dilated stomach into a narrow shoe-horn shaped stomach, which functioned perfectly, and all symptoms ceased.

Dr. Schwyzer (closing): I am very glad that I did not get more severely criticized for bringing the subject of plication before you. The operation I have described is intended only for some of the extreme cases when we feel that the stomach really sags too much, and we would like to do something to counteract it.

Dr. Haines discussed the question of suture in gastro-enterostomy, and he mentioned that it is important to go with the outer suture far beyond the gastro-enterostomy on both sides. However, if we introduce the sutures in the way I described, we do not go much beyond on the efferent side, and we do not get the folds that otherwise are likely to kink the outlet. That is the principal point I wanted to make.

THE CORRECTION OF FRACTURES AFTER APPLICATION OF PLASTER CASTS

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It seems to me the treatment of fractures with plaster casts has gone very largely into the discard in the last few years. The reason for it is, that probably with the introduction of more accurate methods of approximating fractures with bone plates, wires, pegs, etc., surgeons have paid less attention to the closed method in applying mechanical principles and in seeking for all the devices we have had for the treatment of fractures before operative measures were introduced.

I have not had a large experience in operating for fractures. I have done a moderate number of operations. I have seen a good many fractures treated by different methods, including the use of the Lane plate by Mr. Lane; but in the past year or two the experience and observations I have had have led me to think that in too many cases of fractures we have operated. Of course, we have to admit that there is a need and a place for the operative treatment of fractures. There are cases of ununited fracture in which we have to operate in one way or another. There are other cases in which with our best efforts we are unable to get such an approximation as we would like, so that there will always be a place for the open method of treatment; but my contention is, that the cases of fracture that will not yield to some form of mechanical device in treatment are few.

The cases that I wish to show you are some that have come under my care in the last two or three months in my surgical service at St. Luke's Hospital. I am going to show you some pictures and try to explain them as we go along.

Case 1.—The first case I show you is a man, aged 40, who was run over by a heavy auto truck, the wheels passing over both thighs producing comminuted fractures of both femurs, involving the middle and lower thirds. This (showing slide) shows the method we employed in putting him up in plaster. (Plate 1.) The Hawley table is a distinct aid to us in getting extension and counter-extension. You will see that these arms are supported by this device which counter-extends at the crotch. There are two arms, one goes to either side, and they suspend the legs at the knees. The plates I show you will enable you to see the involved sites very well, above, or at about the junction of the middle with the upper third, and from that point almost to the knee-joint, as you will see by the *x*-ray plates. It was out of the question, it seems to me, to plate a fracture of that kind. This man was in profound shock. There was no compound fracture, but both thighs were smashed, so that if you lifted them up you could feel the bones rattle around. We put him up on a Hawley table, with extension on each leg, under the influence of ether, which would permit the handling of the patient in a satisfactory way. We put a cast almost up to the ribs; at any rate, it was well above the hips.

There is one point I should mention in connection with supporting the thighs. Unless you have a great deal of extension upon each leg, with two, three, or four pieces of bone in here (indicating), before the cast gets dry this part will sag unless there is support under the thigh. I have an assistant hold this up (indicating) while the plaster is setting, one on either

side, because at this stage, when it is ready to dry, without that support it would probably sag.

This (showing slide-Plate II) is an anteroposterior view of the left thigh before it was put up in a cast, and the next slide (Plate III) shows you an anteroposterior view after the plaster cast was put on. The next slide gives you a lateral view of the same leg with cast applied. (Plate IV.) The next plate shows a lateral view after cutting and slightly bending the cast. (Plate V.)

Here I want to illustrate the method of making better apposition of these fragments without taking the cast off. If you take the cast off and put it on again, you cannot be sure of a better result at the next trial; with the cast on you have the fragments fixed, and can bend the cast where it is needed. You will see a difference in the alignment and a difference in the tilting of the lower fragments.

The method of correction consists in making a clean circular cut three-quarters of the way around the cast on the *concave* side. This point here (indicating) is separated from this point. After it is cut three-quarters of the way around I leave enough of the cast to make it fairly firm. That would bend there, but we did not bend it far enough so that it would break. You notice the difference in alignment. This patient has a fine functional result. He entered the hospital on the 9th of October last. This slide shows an anteroposterior view of the right thigh. (Plate VI.) That is the way it looked before it was put up, showing two pieces of bone in the middle portion. Here is a lateral view (Plate VII) and the other is an anteroposterior view after it was put in the cast. (Plate VIII.)

When should we put a cast on a limb after it has been fractured? In the first place, after a subsidence of the swelling the limb is reduced in size, may be 15

per cent. You also know that after a limb has been up in plaster for a week or two it shrinks nearly 10 per cent from disuse, and then the cast does not fit.

In putting this up originally with the Hawley table, I relied on the grasp of the cast, the flexion of the legs at the knees, and the body cast supported by the hips for my extension and counter-extension. It worked perfectly on the left side, as the measurements of the leg showed in three weeks. It did not work perfectly on the right side.

When the cast was applied there was a great deal of swelling. In three weeks the swelling subsided, and there was the usual shrinkage of the limb from disuse. The cast, together with the flexion at the knee, did not prevent displacement. The pain increased, which is always an indication that there is mobility or displacement.

We cut away the anterior half of the cast longitudinally up to the hip, applied extension with adhesive plaster, padded the sides of the limb, and reapplied the plaster cast, including the under or posterior half that was left. The leg now shows but half inch shorter than its fellow, and union is taking place, the extension (fifteen pounds) being discontinued.

In a simple fracture with little swelling the cast, plus flexion at the knee, will hold the fragments in position. It may be better in all such cases, however, to provide for extension with moleskin plaster to be used if needed.

Case 2.—This patient is a man, 65 years of age, who entered the hospital about the first part of November. (Plate IX.) He was knocked down by an auto, and sustained a fracture at the surgical neck of the humerus. This is the photograph after the application of the cast. (Plate X.) It shows the method by which it was put up. This is not new, but I find few surgeons are using it at the present time. I have

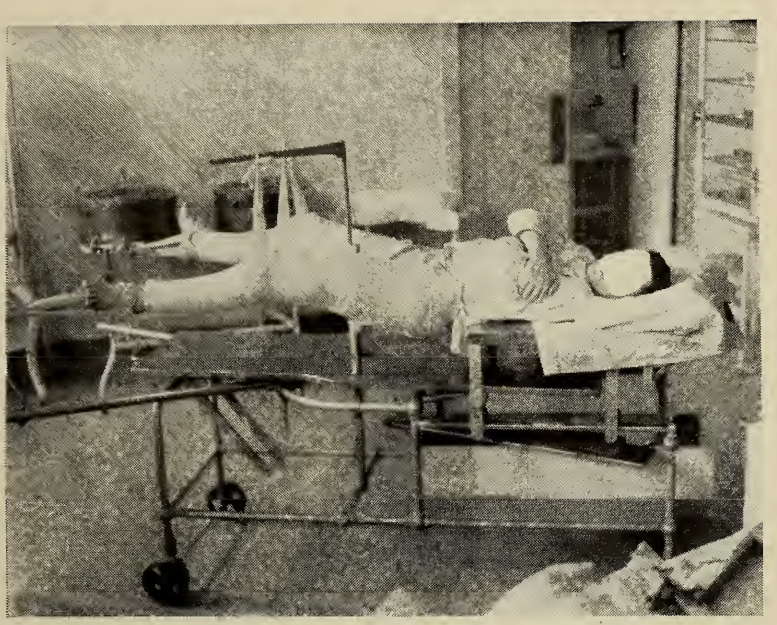

Plate I

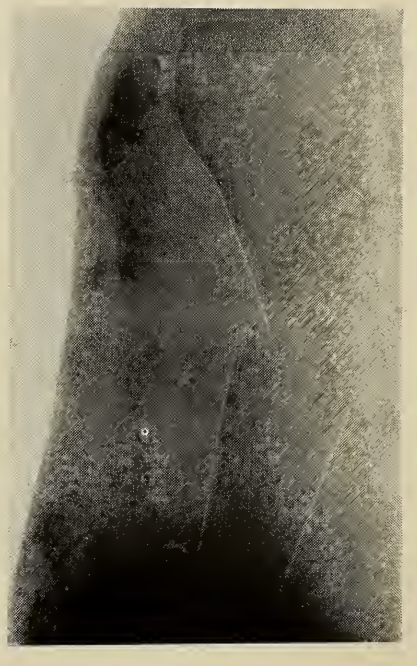

Plate II

Plate III

Plate IV

Plate V

Plate VI

Plate VII

Plate VIII

Plate IX

Plate X

Plate XI

Plate XII

Plate XII

Plate XIV

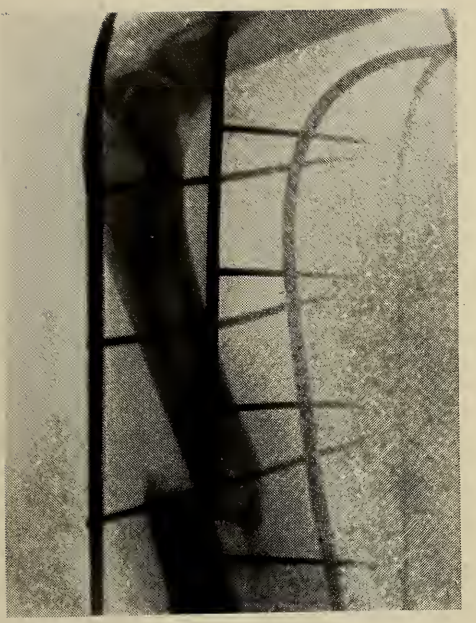

Plate XV

Plate XVI

Plate XVIII

Plate XVII

resorted to this method in half a dozen cases. It is pictured in Tillman's Surgery away back ten or fifteen years ago. In reducing the fracture the arm was abducted and rotated outward; we put moleskin adhesive plaster up to the level of the fracture on either side of the arm to maintain extension, and counterextension was made with a sling under the axilla over a big pad of cotton. Plate XI shows the *x*-ray after reduction. Of course, this is not as accurately approximated as you can do it with wire. However, I do not think wire would do much better than that, and the man has obtained an excellent result so far.

Case 3.—This man also sustained a fracture of the surgical neck the same as the last patient. The accident occurred on the 10th of May last, and it was treated somewhat like the other case, but with a moulded splint. He was treated at St. Luke's Hospital. He was laid up for a week or two, and it was difficult to keep it in position. He got a good result, and went along until the twenty-first day of last month when he had an encounter with a holdup man, and put up the best fight he possibly could, and came in with a refracture at the site of the old fracture. (Plate XII.) I do not know whether he has as perfect union as before, but the plate shows that he did have good union, and the function seems to show it. I show you a picture after the cast was put on. (Plate XIII.) It shows something of the old injury. You see the fractured edges are quite well apposed, except a slight separation. This was put up in the same body cast. This man was 54 years of age, an accountant, who is now able to conduct his business and to use his hand with comfort; and I recommend the body cast, not only in the treatment of fractures of the surgical neck and shaft of the humerus, but in fractures of the clavicle and scapula,

of which we have had several in the last few months. With all other devices, Sayre's adhesive plaster method, with the Mittendorpf triangle, with any other device that I know of, you have continual or repeated shiftings of position. It is difficult to maintain a position in which the patient has confidence to go about his work. This man left the hospital the next day and attended to his business and has done so ever since, wearing his cast. We do not leave them in the cast too long. I have taken off a number of casts in three weeks when the parts were well apposed.

We first cut off the part of the cast below the elbow, next the outer half from the elbow to the shoulder, then the body cast, leaving the arm support in the axilla and under side of the arm for five or six weeks. This gives a chance for early massage and passive movement. The arm is abducted and rotated outward in the reduction, and fixed in the cast in moderate abduction, with the hand in such position that it can serve such use as is possible with the arm fixed. The early use of the arm is important in restoring function.

It is very important in treating fractures that you get early motion and massage, and maintain function, instead of letting the member stiffen up by fixation.

This case illustrates a fracture of the humerus at the middle of the arm. (Plate XIV.) When we got the cast on there was found to be a little longitudinal displacement, a little slipping of the ends of the bone. With extension on, with the moleskin up to the point of fracture, we cut away the exterior of the cast half way around the arm from the shoulder to the wrist leaving a cuff of plaster there, and with padded fixation of the shoulder, by making extension we bring down the lower fragment as far as we need to do, and a pad of felt between the forearm and remaining anterior portion of the cast maintains the extension.

CASE 4.—This patient was a young aviator who fell with his plane three hundred feet before he struck the ground. He sustained several severe injuries. His front teeth were knocked out; his left arm was broken at this point (indicating); his acetabulum was split; he had a Pott's fracture, and was bruised all over. He was in rather profound shock. This was the way he came into the hospital with this temporary splint on. (Plate XV.) He was put in the same cast as I have shown you, and we have end-to-end approximation with some angular displacement. (Plate XVI.)

In the next plate you will see I made an effort to correct this condition. (Plate XVII.) I made a circular cut three-quarters of the way around. We cut it on the concave side because if we cut on the convex side we would crowd the bone ends together. In other words, there would be a tendency to shorten it, but, if we cut it on the concave side, in bending it we did not shorten it any. There is a tendency towards elongation if the cast fits tightly. We do not do this correction until the swelling has subsided. One is an anteroposterior view, and this is a lateral. (Plate XVIII.)

DISCUSSION

DR. WILLIAM FULLER (Chicago, Ill.): I have had no experience with this method of reduction in fractures, but after having talked with Dr. Harsha, previous to the presentation of his paper, and after listening to what he had to say today, I am convinced that in many imperfectly reduced fractures, correction or reduction is possible in the manner he has described, namely, without the removal of the plaster cast. It strikes me that it would serve in a few fractures the purpose admirably, and is worthy of consideration.

I think any method that will successfully reduce a fracture along the lines described is to be preferred to the open operation, not that the latter method is without merit, but because in inexperienced hands it becomes a dangerous method. The operative treatment of fractures calls for the

kind of a surgeon Dr. Richter referred to this morning in performing gastro-enterostomies. It calls for skill, for experience in bone surgery, and for familiarity with this particular department of surgery. The occasional operator should leave gastro-enterostomies to other hands, just as he should leave the operation for fractures to men who have done much of this work.

It is interesting to bear in mind that we view the operative treatment of fractures today a little differently from that first described by Lane several years ago. We felt then, as many do now, that the open treatment of a fracture meant of necessity the use of a metal plate or other foreign material in the wound. We know that the indications may, and are, fully met in many cases by simply removing the small pieces of bone which are often wedged between the bone fragments and with them torn muscle and aponeurosis. Traction and countertraction will frequently replace to a nicety many fractures at this point. Interference further than this, except the repair by a few sutures, of the soft parts, is not called for. No plates, no foreign material of any kind, are needed. Every indication has been fully met, and while a plate or other device would not, if carefully placed on the fracture, interfere with bone union, its use is not indicated or in any sense needed.

I cannot make the point more clear than by briefly relating a case we recently had in the army. The man had a fracture of the tibia which had been unreduced, the fragments having passed by each other more than an inch. Forcible traction and counter-traction on a Hawley table failed to bring the bone ends in apposition. The many spicules of bone wedged between the fractured bones were removed; the soft parts were cut away; and with a subsequent effort at reduction little or no difficulty was encountered. The fracture was a transverse one, and when replaced perfectly it appeared about as difficult to displace as it at first was to reduce. Careful repair by suture of the soft parts was an added security, and nothing further was done except to place the limb in a cast. Many such cases are met with. The only foreign material ever needed in such fractures is a little catgut.

Personally, I have felt very much interested in Dr. Harsha's paper, and his plan of a second attempt to effect a reduction in a fracture without removal of the plaster cast will, I believe, appeal to every one. We know how hard it is sometimes to hold replaced some fractures, and it would

seem that the cast encircling the limb would render it much more stable and steady, and possibly secure it more definitely than would be the case if the fracture were manipulated without any support. I am glad to have heard this report, and shall avail myself of the suggestions it contained.

Dr. F. G. Nifong (Columbia, Mo.): I have run the risk of being considered a crank on one subject, and that is the open-wire-cradle type of splint. The doctor's exhibition here of the correction of fractures and the restoration of them especially emphasized certain things which this type of splint does, and his ingenious way of restoring the contour of the bone or the longitudinal continuity of it is very fine indeed. But why should we have all this massive plaster of Paris wrapped around the individual? He well says that the muscles contract, and it is difficult to keep up extension on account of this contraction, even when you have slight flexion, which we should always have, physiologic flexion so-called. Why do not we have an easy method that will keep up extension and counterextension under direct inspection? I think we have through the open-wire splint. This also exemplifies the value of frequent *x*-ray examinations, a thing that should always be done either in the open or closed method of treatment. The soft parts must be considered as well as the bone in these fractures, whether compounded or not. It is quite as essential. The conservation of these tissues must be considered.

One of the most important principles in the treatment of fractures of long bones, especially of the lower extremity, is extension. Of course, it goes without saying we have immobility, placing the part in absolute surgical rest, and all that. Extension is an indefinite factor. We do not know how much we get in these cases of fracture of the lower extremities in these patients. We do not know until we look and see, and can definitely measure in a Hodgen splint. Extension and inspection are easily obtained by the type of Hodgen splint with which so many of us are familiar. With the open-wire-cradle type of splint we get all the factors that make for immobility, for inspection, for *x*-ray examination, for general comfort, and for extension.

Why is extension so important? It is not the pressure we make on the soft parts here and there, although we can press the comminuted bone in place or place it at a different angle. That may be done also with the open splint, but extension acts in this way through the long bone, as the femur or humerus. We stretch with our Buck's extension,

plaster, or moleskin, the fascia lata. This is the big sheath which envelops and goes around the separate muscle groups and is attached to the linea aspera posteriorly. Imagine a sheath of canvas with two rings at either end and a stick put through the middle attached to a canvas septum representing the intermuscular septa, and let overlap in this way as this fascia lata would be in the thigh. If you make extension, this bone or this stick would fall back in its normal longitudinal position. That is the way extension works in plaster or any other device. It is through the stretching of the fascia lata, making enough extension to let the bone pull back in its place.

The fracture committee of the British Medical Association found 90 per cent were good physiological results in fractures of long bones that had normal contour. Normal contour is very important, and, if we attain normal contour and then in addition have an *x*-ray examination, we shall be pretty sure to get a functionally accurate result. That is one of the things that we can so well see in the open-wire-cradle type of splint, like the Hodgen splint, because we can inspect both limbs to see if we have a normal contour, which means 90 per cent physiological results.

The character of the soft parts which I mentioned before is most important; and the circulation and the general care of the skin, even in simple fractures, are important. Of course, this pertains more particularly in compound fractures in connection with war wounds that have to be treated, and that is the reason the type of splint I have mentioned, which came from the Civil War, gave facility for drainage and care of wounds in conjunction with the fracture. It is no less important in a simple fracture. The comfort of the patient, the mobility of the patient in bed, the patient being able to sit up, and all that, although he does not get up and out in this splint, are very important factors. But we can hardly get this kind of patient up with any particularly good effect when both thighs are broken. However, this splint facilitates the comfort and well-being of the patient which are important factors in the repair of long bones.

Dr. John P. Lord (Omaha, Nebr.): I have lived through the history of the various methods of treatment of fractures. Some years ago we were too much inclined to introduce foreign material in the treatment of fractures, and we had too much infection; and then it was thought desirable to keep away from such methods, if possible.

In connection with the treatment of compound fractures, I fell in the way of using what I call the interrupted adjustable loop plaster splint that enables me to accomplish the same result that is accomplished by Dr. Harsha by his method. It enables one to leave the fractured area exposed, which is desirable in some simple fractures with much traumatism, for it is very desirable to have the parts where they can be watched, because often some of these simple fractures would ultimately become compound if not carefully guarded. This splint was therefore devised. Thumb-screws provide for lengthening or contracting the loop. This splint was made with an adjustable loop because many of these cases were compound fractures and required this sort of interruption. We were in the habit in those days of using bent strap iron or bent heavy telegraph wire for this purpose. There was an advantage in this. This principle is not new, but it does enable one to supervise the part directly and to accomplish readjustment in these cases about as Dr. Harsha cleverly accomplishes it by his method. This enables one to have considerable latitude in the adjustment and handling of fractures in their various forms, as your imagination will tell you.

I have found this device most useful in my experience in handling fractures of the leg especially.

Dr. Emil G. Beck (Chicago, Ill.): Dr. Harsha has shown us that by treating fractures without operation we can accomplish a great deal.

There is one phase of this subject to which I desire to call attention, and that is a false interpretation of the radiograph. I will illustrate with these two cigarettes on a shadow screen, so that you may see how easily we may mistake the position of the fractured bone ends when the röntgenogram is not stereoscopic, or taken in both directions. The stereoscopic picture gives us the dimensions and the angle at which the fractured portions are lying against one another. The single *x*-ray picture has misled many a surgeon to do unnecessary operations, because the displacement seemed very great, whereas, if the bones had been left in the position as they were, the result would have been better, without running the chance of infection.

Let this cigarette represent one bone (indicating). Now you note that when I change its angle it will show a shadow changed in size and form. If I take two cigarettes and put them at this inclined angle (indicating), their length diminishes. Supposing the two were lying against each other

in this way, you would get a straight shadow, but if you turn it, you can see what a different picture you would obtain.

I have used the stereoscopic method exclusively in all cases, and as soon as the fractured limb is put in the cast I immediately take another stereoröntgenogram to prove its correct position. If the bones are not in correct position, the cast is immediately taken off, and displacements corrected.

We have had many examples of the good results that can be obtained by non-operative treatment of fractures. We have had a young woman who, in the mountains of Colorado, was kicked off a horse. In this condition she was taken from Estes Park on a cot some eighteen miles to the nearest railroad station, and then from there put on a train for Chicago. She arrived with the leg materially shortened, and the fragments displaced. By traction we obtained a perfect result.

Dr. Harsha (closing): I am very much obliged to the gentlemen for their remarks. I have not had experience with the wire splint that Dr. Nifong referred to, but I know it is a great advantage in having stereos. I tried to check this work up by having two *x*-ray pictures taken, one antero-posteriorly, and the other laterally; and I quite agree with Dr. Beck that the *x*-ray picture is misleading because you can get good contour and proper length, yet the *x*-ray may show a good deal of displacement when the functional result is really good.

I might say, in all these cases, except the femur case, which is not quite through, we have apparently obtained excellent results. One leg is almost perfect in its appearance, and the other one is still in extension but in good position.

FRACTURE OF THE SKULL, DIAGNOSIS, TREATMENT, AND END-RESULTS

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Surgery of the head prior to the work of Sir Victor Horsley, Keen, and others was a field of uncertainty, in which surgeons in the main did not vie with each other in expressing their zeal for this type of work owing to the disappointing results which so frequently followed surgical intervention for brain abscess, tumor, hemorrhage, and fracture. The incentive lent to the work by these pioneers has attracted numerous surgeons to this field, which today holds an established place in the art and science of surgery. Notwithstanding the enthusiastic assertion of a recently graduated war surgeon that "The entire subject of surgery must be rewritten," it remains our province for the present to apply such knowledge as we possess to the actual working conditions which confront us in our daily rounds in hospitals and industrial centers.

Personal adaptability and dead-room experience are invaluable in acquiring technic in this field, while frequent consultation with the neurological staff will increase accuracy in diagnosis, and the combination will make for the welfare of the patient, betterment of hospital records and advancement in the art of brain surgery. One must early learn, in dealing with skull fractures, that there is no rule of thumb applicable in this field and to recognize in a general and broader sense that each skull fracture will contain certain mechanical problems which are distinctive in their

presentation and, at times, difficult of detection and interpretation.

To be sure there are certain relatively constant findings in skull fractures, but details vary so widely in their expression from physical findings as to render grouping impractical.

The wide degree of variation in the force requisite in the production of these fractures never ceases to hold interest for the examiner. A man jumps from a chair upon which he has been standing while in the act of hanging a picture, and sustains a fracture of his skull; another falls from the top of a standpipe of great height, and pulls up with a few bruises and a broken arm or leg. Such incidents naturally lead one to speculate upon the probable method of the application of force in the production of such fractures.

To discuss the various theories which have been advanced relative to the transmission of force in the production of skull fractures would lead us far afield at present; I cannot refrain, however, from a short description of a basal fracture and the incidence in its production in the body of a man on which I made a post-mortem many years ago while serving as coroner's physician. The decedent was a large man weighing probably 235 pounds whom the police sought to apprehend on the charge of theft. When discovered the culprit was in a railroad yard. Upon seeing the officers and divining their purpose, the thief hopped on a moving freight train, and climbed to the top of one of the coaches. One of the officers quickly followed, and, upon witnessing this act on the part of the officer, the fugitive started to run over the top of the coaches, and, after escaping a fusillade from the officers' weapons, made a flying leap into space landing on his feet when he reached the ground. Later the man was found by the officers

sitting on a bunch of cross-ties about one thousand yards from the site where he jumped from the moving train. He was placed under arrest, and taken to the station where the cell-tender found him dead on the following morning.

This man walked several blocks after his arrest, talked rationally, and ate a hearty supper in the station-house. Autopsy revealed fracture at the base of the skull with extensive intracraneal hemorrhage. One fracture line began at the left margin of the foramen magnum and extended forward, involving the petrous portion of the temporal, the greater wing of the sphenoid, and the superior plate of the orbit. A second fracture line began on the opposite margin of the foramen magnum, and extended outward and upward, ending in the right mastoid. A branch of the left middle meningeal and the cavernous sinus on the right had been ruptured, and pressure from the resultant clot had caused death. The mechanics in the production of this fracture are well illustrated by watching a workman fasten a pick upon its handle. Let the foramen magnum represent the eye in the pick and the spine represent the handle.

The dominant note in the literature on end-results in the treatment of fractures, other than those of the skull, is comprised in the statement that judgment should be founded upon functional rather than on anatomical results. Perhaps in no other region of the body does this expression find a wider range of application than in the field under discussion. It is the structures contiguous to the damaged bone, the structures contained within and dependent in a great measure for their very existence upon the continuity of this bony cage, which most concern us in the management of skull fractures.

It is a pretty generally accepted axiom in brain surgery that head injuries are prone to take their

toll either immediately or at some future time; the former will entail shock, hemorrhage, and fracture, while the latter will find expression in persistent headache, abscess-formation, epilepsy, or insanity.

The great discrepancy between the clincal findings, symptoms presenting, and the extent of fracture, is well illustrated in the case of a patient referred by Dr. North. A man, aged 34, powerfully built, and slightly demented, was confined in a private sanitarium. During the momentary absence of his attendant the patient butted his head repeatedly against the radiator. When admitted to the hospital a few hours later, the patient was rational, answered questions promptly, and expressed regret that he had not succeeded in destroying his life, owing to his disordered mental state. The temperature, pulse-rate, and respiration were little at variance with the normal notwithstanding the presence of multiple, extensive fracture of the vault with one large detached triangular piece of bone driven some distance into the substance of the anterior part of the left lobe of the brain.

Uneventful recovery followed removal of the depressed fragment.

Some of the most extensive and fatal brain and cord lesions have followed injury wherein no fracture was found in the ward, *x*-ray, or dead-room.

The elder Ransohoff has very aptly designated these as cases of shell shock, and he gave a beautiful demonstration in the presence of the writer, at autopsy, of a clinical diagnosis of this condition in a patient dead of injury, wherein cord symptoms presented in the absence of dislocation or fracture of the spine. This proposition is well demonstrated in the so-called "wind-shake" of the lumber jack, who will show you the uninjured bark and sap of a tree in which the integral parts of the bole beyond these lines are twisted and mishapen following the storm.

With the head well shaven one may fairly accurately judge by palpation in the absence of extensive swelling of the scalp, of the presence or absence of fracture of the skull accompanied by deformity. In non-depressed fractures and where there is considerable swelling, it is better to enlarge the wound sufficiently fully to expose the extent of the fracture line. In all cases save a small percentage this procedure will furnish the deciding evidence for the necessity of further operative procedure. The small percentage comprises injuries to the skull with non-depressed fracture line accompanied by buckling of the inner tablet with hemorrhage and extradural clot.

Here *x*-ray should, but not infrequently does not, give us much aid in establishing our future course in the management of the patient. After all, as indicated on a previous page, it is the amount of damage wrought to the contents rather than to the skull itself which is of vital interest to the patient and of greater value to clinicians.

Skull-fracture patients are, almost without exception, suffering from some degree of shock, ranging from slight depression to profund unconsciousness, when admitted. I do not hesitate to say that infinitely more will be accomplished for the patient by employing measures to relieve shock than by immediate operation, the one exception being the presence of active hemorrhage and even here there is room for argument.

Many brilliant results have been recorded following immediate ligation of the middle meningeal, but thus far the writer in practice has had to be contented with the less definite though more rapid method of packing the site of bleeding.

One must guard against advising the intravenous use of salines in this state, in order to avoid the concomitant increase in cardiovascular pressure, and thus

inhibit the natural process of controlling hemorrhage. Salines should be used freely, subcutaneously and per rectum. The use of morphine is questionable, but good results have followed the administration of round doses given hypodermatically in conjunction with saline, heat, and oxygen, in patients seemingly hopeless when admitted. Chloral, in 1 gm. doses repeated in two hours, if necessary, has proven of signal value at my hands in the production of sleep after patients have recovered from shock and begin thrashing about in the bed. Rest is as essential as food, and the exhaustion following a restless night may turn the scales against the patient.

Incidence in the production of skull fractures as in fractures of other bones is always interesting, and will materially assist in the diagnosis of suspected fracture. Fracture of the outer tablet alone may occur in any portion of the vault, but in the experience of most clinicians with whom I have consulted, this variety of fracture is almost wholly confined to the regions of the frontal and mastoid sinuses. In such locations these fractures are always open fractures, and are not to be entrusted to the expectant plan of treatment. Our efforts should be directed chiefly toward preventing infection in these cases by carefully cleansing the nares, fauces, and external auditory canal daily, and preventing further mischief by plugging the nares and auditory canal with cotton or gauze.

A not infrequent experience to those who come much in contact with children is to be called to examine one of these little tots after a fall in which the patient landed on the side or top of his head. One finds a depression in the skull which lends an alarming impression to the examining fingers; blood trickeling from the ear, and flowing from the nose accompanied by vomiting, convulsions, or unconsciousness.

These symptoms and the story of the fall as related by the excited mother, will cause the novice to make a fatal prognosis, but nearly all of these little patients recover to the delight of the mother and the chagrin of the novice.

This is what usually happens in such instances: the outer tablet, being very elastic, gives with the application of force, pushing the inner tablet before it, ending in a "green-stick" fracture. Such patients usually recover from the injury without operation. Although many methods, some of them very ingenious, have been advised for raising the depression, it will gradually spring back into proper shape in a day or two, if left alone.

Linear fractures of the skull without displacement will require evidence other than that obtained by palpation in their recognition. In suspected cases wherein the *x*-ray is not available, exploration, or lumbar puncture, preferably the latter, will aid in establishing the diagnosis. Percussion is of value in such instances, but evidence thus obtained should be confirmed. Fracture of the skull with displacement of the fragments is easily recognized, but one must be on his guard in the presence of much traumatism and swelling, as the latter will readily lead to an error in judgment if not kept in mind.

This variety of fracture of the skull should be placed under the caption of urgent surgery, and dealt with accordingly. This rule, so far as my reading, consultation with other surgeons, and personal experience goes, finds no exception in practice.

Shock and altered reflexes enter into the scheme of diagnosis, and must be given careful consideration in determining the management of the patient. Symptoms of compression which appear soon after the injury are usually due to depressed fragments of bone, but when they come on after the lapse of considerable

time they are almost invariably connected with extradural clot-formation.

Pressure symptoms are the most insistent for relief. Their presence, extent, and gravity may be very accurately determined by studying the fundus of the eye. Papilledema following head injuries, has come to mean to most clinicians that we are in the presence of an edema of the brain with co-existent increase in intracraneal pressure demanding relief. This may be accomplished by elevating depressed fractures situated in the vault, and by lumbar puncture in other instances.

When the trocar is introduced in these cases the bloody spinal fluid flows with considerable force, 12 to 15 m.m., and consciousness in some instances returns before the patient leaves the operating-table. We usually gauge the amount to be removed by the pressure shown in the flow, leaving the canula in until the flow is reduced to dropping. The amount to be removed ordinarily varies between 40 and 60 c.c., but most happy results recently followed the removal of 102 c.c. from a patient in profound coma induced by edema following fracture at the base of the skull. Study of the eye-grounds will give the requisite knowledge for future puncture in the case. One puncture has been sufficient in some of my cases, and others have required four or five punctures before all symptoms have disappeared.

When one thinks of the numerous important anatomical structures intimately associated with the base of the skull he can scarcely conceive a fracture in this region which would not involve extensive damage to veins, sinuses, arteries, and nerves. Clinical recognition of fracture of the base depends largely upon the presence of escaping hemorrhage and cerebrospinal fluid from the mouth, nose, or ear, and ocular and other paralyses.

Facial paralysis is a fairly constant symptom owing to the intimate relation of the 7th nerve with the internal auditory canal, and the frequency with which the fracture line extends through the petrous portion of the temporal.

Subconjunctival hemorrhage and hemorrhagic infiltration into the tissues covering the mastoid and nape of the neck are valuable diagnostic signs occurring in conjunction with the above-narrated symptoms.

A large amount of cerebrospinal fluid may escape through the nasal or auditory canal in basal fracture, but from a limited experience clinically and in the dead-room I have come to the conclusion that undue stress has hitherto been placed upon this sign and that, while it serves to clench the diagnosis when present, one is not warranted in expressing a negative opinion regarding the presence of a fracture because of the absence of this sign.

Cerebrospinal fluid may escape only after rupture of the dura complicated by open fracture,—for example, cribriform plate or those fractures involving the middle ear with rupture of the tympanic membrane.

The dura is so closely attached to the bones at the base as to render fracture of the bone without rupture of this membrane almost impossible, and still such fractures do occur; and it is for this reason that one must be guarded in assigning a proper place to the absence of cerebrospinal fluid in the scheme of diagnosis.

Escaping serum following hemorrhage arising from uncomplicated rupture of the tympanic membrane or nasal mucosa may present the mimicry of this symptom, and lead to a grave error in one's final conclusions.

Notwithstanding the desperate conditions embodied in fracture of the base of the skull about 50 per cent

of the patients surviving the first forty-eight hours following receipt of the injury, make a final recovery. The treatment should be directed with a view of relieving shock, stopping hemorrhage, preventing infection, and controlling pressure.

In consequence of the death of the librarian of the Cincinnati General Hospital it has been impossible for me to obtain our statistics on skull fractures. The subsequent histories, like the post-operative histories of cancer cases, say for ten or fifteen years would be invaluable. It is of vital interest to us as clinicians to learn how many of the patients develop chronic headache, brain tumors, abscess, epilepsy, or insanity. I hope to furnish a paper bearing upon this phase of skull fractures at some future period.

DISCUSSION

Dr. James F. Percy (Base Hospital, Camp Kearny, Calif.): The after-treatment of fractures of the skull is very important. In this fracture, as in all others, we do not follow them up long enough to know the final results. In my service on the West Coast, we have a good many of these head fractures. A large percentage of them are produced by horses. In the camp where I am at present stationed we have some nine thousand horses and mules. If a soldier, following a blow on the head, loses consciousness for a few minutes only we take an *x*-ray, and then put him in bed for one month and keep him under observation for three months. We do this in every case where consciousness has been lost, with or without fracture. This is one of the advantages of having patients under strict military discipline.

There is hardly any question, as has been suggested by the essayist, that many of our cases of epilepsy that have developed in later years, have had as an etiological factor an injury to the skull earlier in their lives.

We have a case now that is causing us some concern, because it seems as if something had been overlooked. We found a skull fracture in an individual three months after he had apparently recovered from a moderate blow on the head with no loss of consciousness. No *x*-ray picture was taken at the time of the injury because it was so slight.

Now he has lost the sight of both eyes, and is probably suffering from a cyst of the brain.

I trust, if any member of the Association has had any experience along this line, that he will present it now.

Dr. Roland Hill (St. Louis, Mo.): In regard to fractures of the skull: I see a considerable number of them each year. There is one point about fractures of the base with bleeding and discharge of cerebrospinal fluid from the ears that I should like to emphasize. These patients have a tendency to die from an ascending infection, and I believe it important to sterilize the ear carefully in order to prevent a meningitis. This can be done by swabbing with half strength iodine, and then have a sterile dressing applied over the part.

Dr. C. W. Hopkins (Chicago, Ill.): In railroad work we have a great many cases of basal fracture in the course of a year. I believe that one of the commonest mistakes in treating these cases has been made by men of apparent experience who have insisted upon having the ears irrigated in the presence of hemorrhage, caused by the fracture, with rupture of the membrane. The order is usually given to a nurse who will irrigate the ear with a plunger syringe, placing the syringe closely into the external meatus, forcing the solution into the ear, which of course enters the middle ear through the rupture. Some of the worst cases of infection, particularly in the mastoid cells, has been caused by this treatment. I have found that the best method in handling these cases is to do nothing in the way of irrigation for washing out the ear, but to fill the outer ear with boric or Thiersch powder, placing a dry compress over the ear with a good padding behind the ear, all being held in place by a bandage. I have had very little trouble by this method with the ordinary basal fracture where there is bleeding from the ear.

I always feel that a case of this kind is much more hopeful where there is free bleeding from the ear than where we have all of the other symptoms of basal fracture, but without hemorrhage.

There is one other matter regarding the treatment of these patients when they are suffering from great shock and are apparently going down hill very rapidly. Several years ago I discovered that when the stretcher or foot of the bed was markedly raised, the patient immediately improved and began to pick up, relieving some of the symptoms of

pressure and of shock. I at first wondered why this was, and finally decided that it was due to the relief of the valve-like pressure at the foramen magnum, which cuts off, by compression, the venous circulation. I use this method now in all cases where the patients are in a serious condition, and have felt that several patients have been saved thereby who otherwise would have died.

Dr. John I. Evans (Wichita, Kan.): The value of stereoscopic pictures in fractures of the skull cannot be overestimated. This is especially true where we have an extensive comminution of bone, and we do have cases in which the bone is broken in a number of places. In some of these cases the bone may be driven some distance into the brain, and, if you do not rely on the *x*-ray and the stereoscopic picture, you are apt to overlook some of them, and your end-results will not be as good as you hope for. So it is my practice in all cases where we have a suspected fracture of the skull to have a stereoscopic picture made whenever possible. The stereoscopic picture often shows a fracture, and makes the diagnosis for you, particularly in the fractures about the base of the skull, when the diagnosis cannot be made in any other way.

Dr. Haines (closing): I wish to thank the members for their discussion and have little to add save to perhaps emphasize one or two points mentioned, but not fully developed in the paper.

The practice of flushing the auditory canal and nares in cases with fracture at the base of the skull is very dangerous to the patient, and should never be permitted. It is analogous to flushing the peritoneal sac in dealing with perforation of the stomach, duodenum, or other parts of the gastro-intestinal tract. Instead of doing something which is going to help the patient get well, we distribute infectious material to regions not involved, and diminish resistance and, in case of fracture, subject the patient to the risk of meningeal invasion.

I also wish to say something more about edema of the brain in skull fracture patients. Edema of the brain is like edema in other structures with this difference: there is little room for expansion, and the increasing pressure by the swelling soon renders the patient unconscious and, if not relieved, causes his death.

The first link in the chain is an acidosis, and this phase in the production of edema is present, not infrequently, when the patient is admitted.

The second step is purely mechanical, and is well illustrated in the instance of strangulated hernia. Owing to the force with which the blood-stream is delivered the arteries continue long after the returning veins have been collapsed by pressure to deliver blood to the parts until the edema and swelling prevents further blood supply ending in gangrene.

In our attempts to correct acidosis and prevent the destructive consequences which it generates, we have found that large doses of alkalies, carbohydrates, and fluids best serve our purpose.

Some one has asked what is considered large doses. Replying, I would say, do not think in grains, but think in grammes and multiply by ten.

A patient with a marked acidosis may require 150 grains of bicarbonate of soda a day, and a half pound or even a pound of sugar to correct the condition.

INJURIES OF THE PELVIS COMPLICATED BY FRACTURES AND DISLOCATIONS

C. W. Hopkins, M.D., F.A.C.S.

CHICAGO, ILLINOIS

During the recent war we have been reading a great deal regarding injuries to the long bones and injuries of the head and other parts of the bony structure, but little has been said of injuries to the pelvis. This may be due to the fact that the greater percentage of injuries received in warfare was caused by explosives, and very few from falls upon the pelvis, squeezing, or rolling, which we so often find in railroad surgery in particular. For this reason I felt that it would be of interest to the members of this association to demonstrate several interesting cases of injuries to the pelvis, which have come under my care recently, all of which were caused by falls, the person being rolled or squeezed, or injured in crossing accidents.

Some of these cases seem almost hopeless when first seen, but, by care and patience, much can be done toward restoring the unfortunates to a life of comfort and usefulness, with minimum apparent deformity and slight disability. Of course, in many of these cases operative measures are necessary, and in some instances several operations, finally to bring about recovery. They are always of great interest, and invariably cause the surgeon to feel well repaid for the time, trouble, and patience necessarily expended in each case.

One of the most difficult cases to handle, that can fall into a surgeon's hands, is that of multiple fracture of the pelvis complicated by dislocation of the head of the femur. It is impossible to resort to the classical methods toward reducing the dislocation, in such a case, on account of the entire pelvic structure being without a fixed point to afford sufficient stability to allow use of proper mechanics. One can well imagine the irreparable damage that can be caused to the tissues or organs within the pelvis if the surgeon does not first ascertain with what he has to deal before attempting reduction. For this reason we have long made it a practice, particularly in persons who have fallen from a height, or have been squeezed, or rolled, sustaining dislocation of the head of the femur, to learn by the *x*-ray what other complication or injuries may exist before attempting reduction. This precaution has often prevented much additional injury and shock to the patient, which would have been occasioned by an attempt at reduction before learning the true conditions.

Frequently such cases will come under one's care with the diagnosis of dislocation of the head of the femur only, which the first attending surgeon had been unable to reduce because he had neglected to inform himself of the true conditions by the use of the *x*-ray, failing to bring about reduction by the usual methods on account of the collapse of the pelvic structure when such an attempt was made. In some instances severe injury has been caused to either the bladder, urethra, nerves, or blood-vessels by the fragments or sharp spicules of bone which had been forced into them by the pelvic collapse or overriding of fragments. A few slides of such cases will demonstrate the injuries to the pelvis received by the various means mentioned above.

Case 1. Plate I.

Case 1. Plate II.

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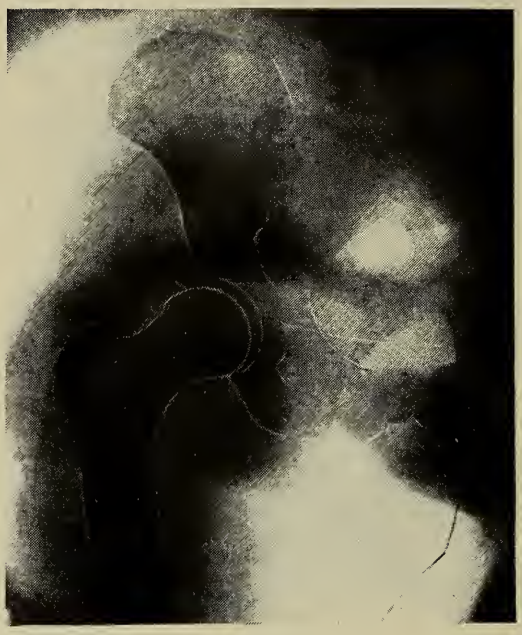
Case 1. Plate I.

Case 1. Plate II.

Case 2. Plate I.

Case 2. Plate II.



Case 2. Plate III.

Case 4. Plate I.

Case 4. Plate II.

CASE 1.—This man is a fireman who had fallen from a height while taking water on his engine. He was taken to the hospital where a diagnosis was made, without the *x*-ray, of intracapsular fracture of the neck of the femur. Upon examination it was found that the crest of the left ilium was lying just below the ribs. Comparative measurements of the two limbs showed no shortening. There was a total loss of sensation and motion in the entire limb.

Very slight extension corrected the deformity and immediately relieved the paralysis. Plate 1 shows a dislocation between the fourth and fifth lumbar vertebræ, with sliding up of the innominate bone at the sacroiliac joint. Plate 2 shows the result after extension and application of a cast. The cast was left in place for three months. The patient made a good recovery, and, although he is not doing his regular work as fireman, he is attending to other duties with very little disability.

CASE 2.—This man is a laborer who was rolled under the footboard of a locomotive. He sustained many injuries, among them dislocation of the head of the left femur. An unsuccessful attempt toward reduction had been made. The man was later sent to Chicago, and, on account of the character of the violence, it was suspected that there were other injuries within the pelvis which had not been diagnosed. No *x*-ray had been taken. Plate 1 shows five fractures in the left innominate bone with an upward and backward dislocation of the head of the femur. The adductor longus muscle was divided, and the limb placed in abduction, as far as possible, the dislocated head of the femur being allowed to remain out of normal position. Plate 2 gives a slightly better idea of the fractures and the comparative position of the head of the femur. The dislocation was allowed to remain, with extension and abduction, for three months, until union had taken

place at the different points of fracture, when an open reduction was performed, replacing the head of the femur in its proper position. Plate 3 shows the improved position in the fractures of the pelvis with marked callus formation with the femoral head in position. The greater trochanter was removed and turned back in the flap at the time of the operation, and later replaced and held in position by kangaroo tendon. This man was under treatment for six months, but made a good recovery and walked out of the hospital. He is now performing the duties of a crossing flagman.

Case 3.—This man is a car repairer who was rolled, sustaining a dislocation of the head of the left femur. Repeated attempts at reduction by the attending surgeon, before *x*-ray examination was made, proved unsuccessful. The *x*-ray examination showed four fractures in the pelvis, one in each pubic and each ischiatic ramus. It can be plainly seen why the attempt at reduction was unsuccessful. This patient was also placed in bed until union in the pelvis had taken place, when an open reduction of the femur was performed with a very good result.

Case 4.—This patient is a young girl who was struck at a grade crossing while riding in a buggy, and was thrown many feet. Plate 1 shows a fracture in both rami near the acetabulum on the left side, with the fragment displaced downward pointing into the labia. There was also a complete fracture through the leaf of the right innominate bone with marked overriding and a complete dislocation at the sacro-iliac joint. This case seemed almost hopeless, and it was fully expected that the girl would be a cripple for life.

Plate 2 shows a loop of bronzed wire where the displaced portion of bone had been brought into position and wired to the pubic bone on the opposite side.

A cast, reaching from the axillæ, was applied with the limbs in abduction, securing the best possible position under the circumstances. This was allowed to remain for four months, after which time it was found that good union had been obtained. At the end of five months she was able to walk without a limp, to drive an automobile, to climb stairs, and to ride horseback. There was slight shortening on the left side, but beyond this she has made a full recovery without any apparent deformity or disability. Of course it is very probable that she will never be able to bear children on account of the injury to the pelvis, which has caused ankylosis and some distortion of the pelvic outlet.

The foregoing cases demonstrate the apparently hopeless cases that may fall into one's hands and the surprisingly good results which are sometimes obtained when we are almost discouraged. They also demonstrate what an improper or incomplete diagnosis may do by causing additional injury.

I do not know of a more important subject or one that can be more instructive to the traumatic surgeon than having cases of this kind brought to his attention to impress upon him the necessity of a complete and thorough examination and diagnosis before undertaking treatment.

DISCUSSION

Dr. W. D. Haines (Cincinnati, Ohio): The Association is to be congratulated on the presentation of these slides by Dr. Hopkins. I do not think in all my experience in medical or surgical societies I have ever seen such desperate cases as those presented here wherein the patients recovered. I have seen a number of these injuries, but the amount of force requisite in the production of pelvic fractures generally puts the patient out of commission. A constant thing in my experience with pelvic-fracture cases is rupture of the bladder, rectum, or other abdominal viscus. With the shock and the paralysis that follow, sometimes these patients linger

for a time, but nearly all of them in my experience have passed away.

I have in mind the case of a man who was hauling lumber. His horses became fractious, and he was dragged upon the ground for a short distance, still holding to the lines. In this case it was found that the tuberosities of both ischia were fractured. The patient recovered.

The proposition that Dr. Hopkins has presented here is analogous to fracture of the skull and of bones in other parts of the body. If we can keep the bones in apposition they will heal like any other bones. It is the damage to the structures contained within the bony cage that causes the high mortality that follows skull, chest, and pelvic-bone fracture.

Dr. E. M. Sanders (Nashville, Tennessee): One of the fundamental principles in the management of fracture cases in general is that if you have the fragments in apposition you will not have pain. This boy was having pain, and was losing sleep and could not rest, and that is just as essential as if the fracture had been reduced; and it is one of the very important principles in the management of fractures. In other words, we may reduce the matter to this: If a boy has a fracture which still pains him after it has been apparently reduced, it is very evident that the fracture has not been properly reduced.

Dr. John I. Evans (Wichita, Kan.): A short time ago a young Mexican came under my care who had been working in a ditch. He was suffering from a fracture of the pelvis in four places, with a dislocation of the left hip, a compound comminuted fracture of the tibia and fibula. He also suffered from extensive extraperitoneal hemorrhage in the right inguinal region. He was in great shock, and we thought he was going to die. We did nothing but stimulate him, and tried to get him over the shock. After two or three days in the hospital he sufficiently recovered so that we could have an *x*-ray picture taken, and a diagnosis was then made of injury of the pelvis. Through the assistance of internes in steadying the pelvis, after a good deal of hard labor, we succeeded in reducing the dislocated hip, but it was the hardest job I ever tried to do in my life. The fracture of the leg was put up as best we could. I took the cast off the leg later on, and put on extension, and we finally obtained a good result. This young man left the hospital after a period of three months in a fair condition. He could walk with very little limp.

Dr. A. E. Benjamin (Minneapolis, Minn.): One of the most interesting cases of fracture of the pelvis I ever saw was where there was a rupture into the bladder, which had occurred two days before I saw the patient. There was a good deal of extravasation of urine and blood, and the man was in a comatose condition. We took an *x*-ray picture, and found a fracture of the ramus of the pubes, a spicule of bone had punctured the bladder. The man recovered after a long time. We had to use urethral dilators, and nothing was done for the fracture except to keep the patient quiet. Nature took care of the spicule of bone, covered it and used it; and he eventually got well.

The second case was a man who was injured in getting off a street-car, sustaining a compound comminuated fracture of the tibia and fibula, with a fracture of the pelvis and rupture of the bladder. He was taken to the hospital immediately, and inside of an hour and a quarter we had the abdomen opened, and bladder drainage instituted. He made an uneventful recovery, but there was some subsequent treatment directed to the bladder.

A third patient sustained an injury through two cars coming together, fracturing the pelvis, but the injury did not produce much deformity. The ramus of the pubes in this case was much injured, and the urethra was badly torn, so that subsequent treatment of this man was aggravated because of the constriction of the urethra.

Dr. D. S. Fairchild, Sr. (Clinton, Iowa): I had the opportunity of seeing some of the cases of fracture which Dr. Hopkins has shown you. I saw them first, and recognized the fact that only the best means of diagnosis and the most skillful treatment should be thought of.

The first case, in which there were five fractures, occurred in this way: The man was shoveling coal, and the man on the engine did not know he was there. He fell in trying to get out of the way, and the engine kept crowding him against the building. His cries were not heard because of the noise of the engine, which kept on moving, until it came to a standstill at its point of destination. This man was taken to the hospital, and I saw him within half an hour after his injuries. Unfortunately, we had no *x*-ray. The man was doubled up in the most horrible manner, suffering great pain and shock; and all we did was to give him morphine, and make him as comfortable as possible.

Not being able to see through the tissues with the naked eye, not having any *x*-ray picture, I felt the wise thing

to do was to write Dr. Hopkins, and suggest that this man be taken to Chicago. This was done with the result that Dr. Hopkins has mentioned.

With regard to the condition of the soft tissues: On one side the abdominal muscles had been ruptured and almost all the abdominal organs were outside of the abdominal cavity and in the sac thus formed. This did not come about from the injuries to the nerves, but it was done to the muscles at the time of the accident. The terrific force had torn things in a most distressing way. As soon as the man could be removed he was sent to Chicago.

The other case I saw in the northwestern part of the state, where we had an *x*-ray picture made of the kindergarten type, and the *x*-ray did not reveal anything to us at all, but one leg was shorter than the other. We thought there was a dislocation of the hip. The doctor who first saw the patient made an attempt at reduction, and I likewise made an attempt to reduce by manipulation, and the head of the bone apparently slipped nicely into the socket. He had received a degree of comfort, and so did I at the time, but, unfortunately, in an hour or so it was back again in the old position. We assumed there was something more than a dislocation of the hip, and as soon as I could advise with Dr. Hopkins with reference to taking him to Chicago I did so, and he was accordingly taken to Chicago, and Dr. Hopkins treated him with the result he has described.

The astonishing thing to me is, that the man lived after all, after suffering such a tremendous accident, with so much traumatism; and the man with multiple fracture, whose name is unpronounceable, was treated with the utmost skill, as has been shown here today, and the results were unexpectedly good. I expected to receive a communication from Dr. Hopkins that the man was dead. He had a right to be dead, but with the great persistence displayed and careful attention received the man did well.

These are some of the cases that come to us in the course of our practice, and the skill we manifest is in exercising good sense as to where they can be taken care of as in these two cases.

Dr. George N. Kreider (Springfield, Ill.): There is another form of fracture of the pelvis that has not been spoken of. A dentist, 26 years of age, was in a large automobile when a drunken driver coming up over the top of a hill at the rate of seventy miles an hour struck a wagon loaded with corn. The driver escaped without any injury,

but the dentist suffered four fractures of the pelvis, and the strange thing is his femur was not fractured, but the head of the femur was driven across the pelvis almost to the other side. He was much shocked of course. He was seen by another practitioner. I saw him two days afterwards. There was a very good result from the treatment of this case, and one reason why I speak of it is to call attention to what is known as the Maxwell-Ruth plan of treating fractures of the femur. It ought not be called the Maxwell-Ruth plan. It should be called the Phillips plan, but it has been put forward in the literature of the profession as the Maxwell-Ruth method. It was impossible in his condition of shock to have reduced the fracture in any other way to have done any good, but by using the Maxwell-Ruth plan we accomplished a great deal. In the first place, we inclined the whole bed or cot to one side, put a very broad bandage around the body here (indicating) with a weight over the pulley on this side, then a broad bandage around the upper end of the thigh, pulling outward and upward, and then putting extension on the foot. This man suffered a great deal of pain, but made an excellent recovery. He works now as a dentist. This means that he stands many hours on his feet. It is now over six months since the accident, and apparently one would not know that there was anything wrong to see him walking on the street. There is a slight shortening of the leg, but you would hardly notice it as he walks. The case has passed from under my observation, so that I have not seen the *x*-rays to determine what the condition of the bone is at this time. But these cases, as has been stated here, do unexpectedly well. Dr. Speed reported such a case not long ago in one of the surgical journals, and you will find very few of them in the literature where the femur has been driven clear through the acetabulum and into the pelvis. Fortunately, in this case there was no tearing of the bladder. That is a very important saving clause. If there is no injury of the bladder, the hope for the case is much greater than if it is torn.

Dr. Hopkins (closing): The plates I have shown you illustrate a few of the most unpromising cases with which we have to deal. Of course, in traumatic surgery, particularly in railroad work, there are a great many cases of fracture of the pelvis that give very little trouble. The complication of a displacement of the head of the femur fortunately does not occur very frequently, but, whenever a patient comes under my care who has received a dislocation of the

head of the femur by being rolled or by falling from a height, I am always careful to ascertain whether or not there has been any other injury to the pelvis before making any attempt toward reduction. You can readily understand why this is necessary from the plates I have shown, and which cases could have been greatly damaged by endeavoring to reduce the dislocated head of the femur with the pelvis so badly damaged. There is always danger of serious injury to the vessels or nerves,—the bladder, the urethra, etc.,—by an effort to make reduction by the classical manipulation, using the limb as a lever, which would bring great force to bear at the point of fracture, and at the same time not reduce the dislocation.

I think one common mistake made in handling these cases of fractured pelvis is due to the patient being allowed to get up before there is complete healing or complete union at the point or points of fracture. When a man walks his entire weight is hung upon his pelvis, first one side then the other, and it is a very easy matter to break down the soft callus, necessitating that the patient again be placed in bed for an indefinite period after suffering from severe symptoms, one of the most common being that of pain in the thigh which is referred to the knee, by pressure upon the nerve. One patient of this kind who was allowed to get up too soon, and who had gonorrhea, was again placed in bed on account of supposed gonorrheal arthritis in the knee-joint. When I saw him I discovered that the entire trouble was due to pressure upon the sciatic nerve at the point of fracture where the callus had been broken down by his being allowed to walk too soon.

Another common complication in these cases of fractured pelvis, particularly where there has been much damage to the soft parts within the pelvis, is that of severe acidosis, and later possible infection at the point of fracture where there has been marked hemorrhage. One of the worst cases I have ever seen was in a young lady who was struck and thrown a number of feet, sustaining multiple fractures of the pelvis, one of the fragments being forced through the vaginal wall. When she was picked up the bony fragment was again withdrawn from the vaginal wall, being partly reduced, the laceration closing. In a very short time she developed a very severe acidosis on account of absorption of protein matter and fibrin ferment, and later developed a tremendous abscess. For a long time we almost dispaired of saving her life. She has fortunately recovered suffi-

ciently to be up and around with but a slight limp. The same condition could have been caused if the head of the femur had been dislocated, and marked pressure made at the points of fracture by attempts toward reduction, driving a bony fragment through the vaginal wall.

I invariably watch for acidosis in these cases, and undertake to combat it by early administration of large doses of sodium bicarbonate and by reducing the amount of protein in the diet, as these patients are already taking up about all the protein matter that they can handle by absorption, as is easily discovered by the relation of the degree of temperature to the pulse-rate, and their nitrogen ratio. I find that they run a less stormy course by this method than was formerly seen when so little attention was given to this particular phase of the treatment.

VOLKMANN'S CONTRACTURE

E. M. Sanders, M.D.

NASHVILLE, TENNESSEE

One of the most serious complications that can arise in the treatment of fractures and other injuries of the extremities is a Volkmann's contracture. This unforseen deformity usually presents itself to the surgeon as a great surprise, and to the patient as a greater disappointment. When the case is well developed before recognized, the treatment requires great patience, good judgment, and unusual skill on the part of the surgeon, and a mental attitude of faith and perseverance on the part of the patient.

Since the illustrious Volkmann described this condition, in 1869, and gave us the definite clinical picture of claw-hand, or "main-en-griffe," a few observers, including Lesser, Thomas, Sayre, Murphy, and others, have given the subject earnest thought and investigation; but the profession as a whole has paid very little attention to this most interesting condition, inasmuch as it is not a common occurrence. After careful investigation, I am led to believe that it happens more frequently than the impression one gets from the literature.

Inasmuch as the condition is usually due to bad initial management of the injury, few of us are inclined to report and discuss our cases, or those of our confreres, with the same freedom that we would discuss other complications of equal seriousness and coming about through unavoidable means. Doubt-

less, there are many cases not reported, and some are diagnosed as other conditions.

Definition.—In the ordinary acceptation of the term, "Volkmann's contracture" means a permanent longitudinal contracture of the flexor muscles and tendons of the forearm, usually accompanied by more or less fixation of these muscles to each other and to the surrounding tissues, frequently complicated by a permanent shortening of the anterior capsule of the wrist-joint. However, a similar condition of other muscles may occur. The biceps has undergone this degeneration, the flexor muscles of the leg, and, in fact, the flexor muscles of all four limbs on the same patient at the same time, caused by the application of four tourniquets simultaneously used with the hope of saving the patient's blood during an alarming hemorrhage from the uterus.

The volar surface is practically always involved, and the extensors are seldom interfered with, although the pressure is equal all around the arm.

The flexors of the thumb are seldom affected, probably on account of their extensive origin and the great length of the body of the muscle, although we have had one case in which we used the prophylaxis where the thumb was more deformed than any of the fingers, due, we believe, to our failure to reach and relieve the tension in this deep region.

Frequency.—The records show that Volkmann's contracture occurs most frequently in children from one to fourteen years of age, and usually follows fractures about the elbow and upper forearm, coming, as a rule, in those cases where the arm has been put up in the flexed position and dressings applied under anesthesia immediately after the injury.

Just why the condition is more frequent in the flexor group of the forearm than in other groups of

muscles is not definitely settled, but it is believed by some observers that this is due to two facts:

First—The region is more bountifully supplied with blood, the return flow of which when interfered with brings about a greater congestion of the tissues with the same amount of interference than in other parts.

Second—These groups of muscles are bound around with strong fascial sheaths, which prevent dilatation and relief of the congestion.

The condition is much more frequent in children than in adults. This may be due to the fact that their muscles are more delicate and immatured, and, therefore, more easily destroyed; but many observers believe that children are made to suffer greater pain after the reduction of fractures and the application of splints than adults, who under like circumstances insist on the dressing being loosened or removed, and consequently the threatened condition is often prevented.

A fracture which has been properly reduced and had a suitable dressing applied should not be a painful condition, except in extraordinary cases.

Etiology.—The etiology is by far the most important element of the subject; and the fact that such a small percentage of those who have fractures about the elbow and upper forearm badly treated develop this lesion, might suggest the possibility of a fundamental deficiency in the nutrition of the muscles of those in whom is does appear.

The condition can be brought about in two distinct cases:

1. In cases where splints, dressings, bandages, or tourniquets are applied too tightly and allowed to remain too long; or where they are applied properly and subsequently the injured member swells and produces a condition of ischemia.

2. In those cases where no dressing, or a loose and properly applied dressing, has been put on, and an effusion of serum or blood, or both, comes from the inside under the sheaths of the muscles, and produces the pressure.

This fact is our greatest comfort when we have treated the case and our bulwark of protection when the condition has led us into medicolegal entanglements, which, I may add, is no trivial phase of the subject. It not only fills the long-felt want of a legal loophole, but it is a scientific fact which demands our careful consideration in the management of these cases where the trauma has been sufficiently severe to produce great congestion and a subsequent destruction of tissue.

From the time that Volkmann wrote his first paper, some investigators have claimed that this paralysis is due purely to muscle changes. Lesser agreed with Volkmann, but later Lapinski, Mannkoff, and others claimed it to be a primary nerve damage, while Bardenhauer believed the muscle and nerve changes occurred simultaneously, both being due to the injury.

The deposition of some toxic material, peculiar to the individual, in the congested area has been suggested as the cause, as have other fanciful theories.

These investigators, of course, all had good arguments for their positions, and experimental work has been done to prove and to disprove all these theories; but, I think with the light before us, considering the facts that all investigators have brought out, it is possible for us at this time to correlate the varying views as to the etiology; and it is my belief that the late Dr. John B. Murphy was correct in his argument that the condition is primarily one of ischemic muscular atrophy, due to a myositis resulting from pressure and interference with the circulation in the individual muscle fibers of the bundles of muscles in-

volved. It is a fact beyond dispute that the paralysis which follows an injury of a nerve alone is a flaccid paralysis, and allows the opposing muscles to do the contracting. It is, therefore, evident that injury to nerves alone cannot be the primary factor in producing this condition.

Pathology.—The pathology has been studied by Lesser, Peterson, Bernayes, Edington, Roland, Powers, and many others, and their findings are so nearly identical that they may be summed up as follows: The most characteristic findings microscopically are the absence of the nuclei and the loss of cross striations of the individual muscle fibers; and in the more severe cases round-cell infiltration is found with increased connective-tissue formation, accompanied by atrophy and degeneration of the muscle, with a beginning connective-tissue deposit around the blood-vessels. In a very severe case where the arm was amputated, the muscles had degenerated into a homogeneous hyaline mass, and the individual bundles of muscles could not be separated and recognized.

Symptoms.—Taylor has divided the symptoms into immediate and remote. The immediate symptoms found when the trouble begins are as follows:

1. Rapid swelling of the fingers, hand, and forearm; and stiffening of the fingers a few hours after the injury.

2. Pain is the most constant and prominent one, and is so persistent and severe as to prevent rest or sleep, day or night, and will usually cause an outcry from the patient unless opiates are administered. There are rare exceptions to this rule, however, as cases have been noted where no history of pain could be elicited.

3. Cyanosis well marked from the elbow to fingertips.

4. In some cases blebs and skin sloughs occur at the maximum-pressure points unless the dressings are promptly removed.

5. Temperature up to 102° or 103° for a few days may be present.

6. Rapid pulse for about the same length of time.

7. Chilly sensations may be felt.

8. Headache and general malaise to some degree, usually.

If the dressings are left undisturbed the pain subsides, the swelling gradually disappears after the first three or four days, the temperature recedes, and the patient becomes practically normal. The most alarming fact about this stage of the trouble is that the muscle substance undergoes the destructive changes in from five to forty-eight hours, depending upon the degree of pressure; and when these changes have occurred it is too late to ward off the end-results. The loss of voluntary motion at the end of a few days indicates the coming of the condition, and the whole muscle mass has a hard, brawny touch to the fingers.

The real contracture, which, when once seen, can never be overlooked, or the second stage, as indicated by the characteristic position of the hand and fingers, may start to develop within the first twenty-four hours, or it may not begin to appear for six weeks. It usually makes its appearance during the third week, and grows progressively worse for about three months, after which period there is practically no further shortening of the muscles involved, although there is a gradual increase in the deformity, due to the steady growth in the length of the bones, with no compensatory increase in the length of the cicatrized muscles.

The first parts of the hand affected are the second and third phalanges of the fingers, and as these assume the flexed position extension at the metacarpophalangeal joints sets in. As the contracture pro-

Fig. 1. Shows how fingers can be partially extended when wrist is flexed.

Fig. 2. Illustrates the typical extreme flexion of the second and third phalanges with extension of the first when the wrist is extended.

gresses this deformity is exaggerated by flexion of the wrist and slight flexion of the elbow in semi-pronation.

A characteristic feature of these cases when well developed is the action of the fingers and wrist to passive motion. If the wrist is forced to a fully flexed position, the fingers can usually be passively extended to a straight line; but if the fingers are held in this position and the attempt is made to extend the wrist, it is found to be impossible. Every degree of wrist-extension is accompanied by a corresponding amount of flexion in the fingers until the extension at the wrist is limited by the full flexion of the fingers; the muscles are usually quite rigid before the wrist has been fully extended to a straight line.

During such manipulation the flexor tendons stand prominently out, like whip-cords. The forearm at this stage is much decreased in size, and the flexor muscles which should be prominent are a small, hard, inelastic, cicatricial mass.

In nearly all of our cases necrotic pressure-scars have been present when the patients came under our observation.

Complications.—A number of complications that may occur require differential diagnosis. The initial damage may have involved the nerves, and Thomas found that in 62 out of 107 cases such injury had occurred. The nerves involved are usually the ulna, the median, and the musculospiral.

It must also be kept in mind that damage to the nerves may be secondary to pressure produced by the resulting ischemia and cicatricial mass formation. In such cases the function of the nerve is more apt to be diminished than abolished, although entire loss may occur in extreme cases.

Lesions of a nerve, such as the ordinary wrist-drop, or disturbance of motion or sensation, where the

nerve has been severed or caught in a deposit of callus, or in a mass of fibrous tissue, must be investigated and dealt with.

The drop-foot, occasionally produced by the application of plaster or the prolonged use of Buck's extension, where the pressure has been made on the external popliteal nerve as it winds around the neck of the fibula, is sometimes confounded with the condition in the lower extremity.

The determination of the degree of damage done to the median nerve is quite difficult, especially in young children who have recently undergone the ordeal of acquiring the deformity. The determination of the damage to the ulna nerve is easier. The child will usually try to separate and approximate the fingers, which, if possible, indicates a good ulna supply to the interossii muscles. On the whole, young children are uncertain in their response to stimuli applied to muscles of the hand, and trophic disturbances, thin, glossy skin, and coldness and cyanosis should arouse our suspicion.

A positive reaction of the flexor group to electric stimuli indicates the presence of some uncicatrized muscle, and, therefore, improves the prognosis.

Damage to the great vessels of the extremity may permanently impair recovery. This complication takes on most serious aspects, and brings us into a field of very difficult endeavor.

Prophylaxis.—Too much stress cannot be laid on the prophylaxis. Special precaution in dealing with all fractures about the elbow region in children should be practiced, and manipulation should be gentle to avoid additional traumatism and swelling.

Fixation in extreme flexion is dangerous because of circulatory disturbances, and very frequent observation is imperative.

When the splints are made, they should be so shaped and padded as to avoid localized-pressure spots. Dressings should not be applied too tightly, and one should allow for increased swelling. Elevation of the extremity should always be practiced when possible.

Since it is impractical for us to inspect the case every five or six hours, which would be the ideal arrangement, the next best thing is to always instruct the parents, when such a case is under our observation, to call the surgeon at once if there is unusual and persistent complaint on the part of patient, or if there is pain sufficient to prevent sleep or to demand narcotic drugs, especially if accompanied by cyanosis and swelling. In case the surgeon cannot be reached, the parents should be further instructed to cut the entire dressing loose from the arm, and rest it on a pillow until the dressing can be readjusted.

When the above-mentioned initial symptoms are found, not only should the dressing be removed and the arm straightened to allow better circulation, but, with the site of the fracture supported, gentle massage should be given from the fingers upwards, followed by passive motion of the fingers and wrist. The child should be persuaded to coöperate, and active motion should be given to the fingers and wrist. Lesser has proved this to be of great value by his experiments on dogs, where, after he had produced the condition, he found that the dogs that were allowed to get up and run around on the injured muscles got far better results than the ones kept at rest, and the dressings simply removed.

All these procedures have the aim in view of reducing the swelling, and improving the circulation and nutrition of the muscles threatened with degeneration. One should always remember that the fracture itself is of secondary importance, and that a good functional result is far better than an anatomically

perfect bony structure and a Volkmann's contracture resulting from our treatment.

If, in spite of the precautions just outlined, the pain, swelling, and cyanosis persist or increase, we must realize that we are dealing with a group of muscles under compression beneath the deep aponeurosis, and the only hope lies in applying the principal of decompression; therefore the aponeurosis should be split, either in one long slit, or the same result can be accomplished, preferably, through a series of small parallel openings overlapping one another laterally in the skin over the whole length of the bellies of the flexor muscles from the elbow down. If the skin is hard and brawny, it should be slit accordingly. Gentle passive motion should be given to help restore the muscle-nutrition before the patient recovers from the anesthetic.

We have every reason to believe that in some cases where we have followed this procedure, the operation was quite justified. These cases have gotten useful arms, with only a mild degree of trouble; and, in our best judgment, they were fully developed acute cases which would have terminated seriously had they been left alone or simply had the dressings removed.

Delay in instituting the proper precautionary measures lessens the usefulness of the procedure and makes the prognosis more unfavorable.

Treatment.—Leaving the management of the acute stage, we come to what can be done for the relief of the fully developed contracture deformity. When these patients present themselves for treatment, and a diagnosis of a Volkmann's contracture without complications is made, there are three avenues open to the surgeon:

1. The method of Jones, where gradual extension is applied to the fingers and wrist by a specially prepared splint, using progressive extension from time

to time, accompanied by vigorous active and passive motion, hot applications, and electricity.

Mild cases can be satisfactorily managed by this method. Sayre and others have used this line of treatment with good results. We have used it with surprisingly good results in some cases, and all were greatly benefited.

The value of this method of treatment depends largely upon the promptness of its application, the coöperation of the patient, and the persistence with which it is carried out.

2. The more severe cases cannot be so treated with any degree of satisfaction, and should be subjected to the operation of tenoplasty, where elongation of the tendons of the affected muscles is accomplished by using the LL incision on the tendons. This should not be done earlier than three months from the establishment of the contracture, for it takes about this length of time for the maximum damage to be done.

In these cases one should never overlook the necessity of capsulotomy, where the anterior capsule of the wrist-joint is permanently contracted.

3. In the more severe cases, and especially in children, resection of both bones of the forearm, as done by Mickulicz, is justified, and has given a fair percentage of good results in apparently hopeless cases.

These last two methods re-arrange the mechanical relationship between the contracted muscle tendon units and their bony points of origin and insertion. However, if either of these operations be done, and the extremity allowed to go without careful after-treatment, there is apt to be more or less return of the deformity, as the steady growth of the bones of the forearm lengthens the distance between the origin and insertion of the cicatrized muscles.

Before either of these operations be advised, one should remember the increased risk of infection because of the deficient nutrition of the parts, and the resulting adhesions between the tendons, and, where the bones are dealt with, also the danger of nonunion and deformity.

The prognosis should be guarded, as the end-results are apt to be far from ideal.

CONCLUSION

In closing I would like to emphasize the fact that, as a rule, we are in too great a hurry to reduce fractures and apply dressings, and this is especially true of fractures of the forearm and about the elbow in children.

DISCUSSION

Dr. John P. Lord (Omaha, Neb.): I want to touch on two or three points in the discussion of this excellent paper. In the main, I quite agree with everything that has been said. I have been very much impressed with the factor of myositis and the resultant degeneration producing these crippling effects. A recent case has impressed me with the neurotic element of the question of the etiology. A lad with a typical deformity of this kind had a fracture at about the junction of the middle and terminal thirds of the radius and ulna. It had been a compound fracture. The lad came at the seventh week with blisters on his hands, though there was no knowledge of a burn having taken place, but we decided that on account of lack of sensation, he had had a burn. Lack of sensation both to heat, cotton, and so on, was very marked. It seemed to be a typical case. There was, however, considerable displacement of the bones, and it was thought that because of extensive nerve involvement in this case operation was justified. Accordingly, operation was recommended and accepted. I was astonished to find how little muscular damage had been done. There was but slight evidence of myositis in the terminal bellies of these muscles at the injured point, which was practically in the tendinous and aponeurotic portion of the arm. It was noted, however, that the nerves had been stretched

across the fragments, and the cicatrix involved nearly the circumference of the arm. I was also surprised to find how readily we could improve the position of the fingers by the dissection of one-half inch of the bound down muscles. The liberation of the nerves was followed by very quick response and improvement in the sensation and function was immediate.

I quite agree with the essayist that most of these cases are due to myositis. I cite this case with nerve involvement which was seemingly a typical case of Volkmann's contracture without myositis to illustrate a very able factor in the etiology.

I wish to raise a point which is not new, but which is not sufficiently observed. The doctor mentioned shortening of the bones of the forearm to get relaxation of the tendons because the skeleton is evidently too long. It is easier to lengthen the bony structure than it is to lengthen the densely contracted soft structures. The extended position of the hand is the position to be obtained. All these cases have a very crippled hand and a very imperfect functional result. Inasmuch as there is great shortening of the flexors by resection of the carpus the hand may be brought to the desired position in extension. It has been my practice to resect wrists in these cases which acts better and does not prevent the very early after-treatment by passive motion to the same extent that division of the bones of the forearm will do, and you get this position (the hand in extension) which will give you much better function, with better flexion and extension than when the wrist remains in the position which is too frequently that of flexion. The doctor's case shows a relatively straight wrist. These patients present themselves in this position (indicating flexion), and if you can reverse the position of the hand you will gain a great deal in the way of flexion and function of the fingers. This is well known, but I find that surgeons, as a rule, do not bear this point in mind, to dorsi-flex the hand in a position of full extension.

Dr. D. S. Fairchild, Sr. (Clinton, Iowa): This is certainly a very interesting subject, and we have listened to a very interesting and instructive paper. It is interesting to me because as Chairman of the Medico-Legal Committee of our state medical society, I have occasion to review some thirty cases of malpractice every year that come from various sources, and Volkmann's paralysis is one of the subjects that comes up for consideration from time to time, and I

have taken pains to ascertain the number of cases of myositis that were due to direct pressure of the bandage. Dr. Steiner, Professor of Orthopedic Surgery in the state university, has helped me to get together such data as he could gather on this subject, and he found that eighty per cent of the cases of Volkmann's paralysis were due to tight bandaging, while twenty per cent were due to injury of the nerve probably. Unfortunately many of these cases will develop after twenty-four hours or in less time than that by tight bandaging, and before the doctor has discovered anything wrong his patient is in a hopeless condition. The difficulty of the situation is very great. Therefore, I have from going over these cases had the feeling that when I have treated a fracture of the forearm, even with the most careful bandaging, I might have one of these nice verdicts and I would not know what to do with it. I expect a jury would decide that there was very little excuse for the accident happening from tight bandaging. However, if it comes from the injury it is quite different. Therefore, the suggestion of this paper is to apply the bandage with the greatest care in a fracture of the forearm; that the utmost circumspection should be enjoined in putting on the bandage because of the fact that pressure from the bandage so often causes the trouble. In other words, in eighty per cent of the cases of Volkmann's paralysis it has been shown to be due to the pressure of tight bandaging. The after-treatment will secure some degree of satisfaction, but it does not help the man out of difficulty when he goes before a jury in such a case for malpractice. We have not been able to adjust these cases except by a settlement. We would not dare go before a jury and ask a doctor on the witness stand to justify a Volkmann's paralysis.

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